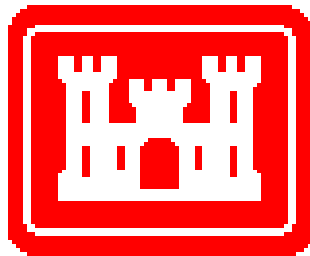


ANNUAL REPORT

ON

WATER CONTROL MANAGEMENT

WATER YEAR 1998



U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

JANUARY 1999

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PREPARED BY
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT
RESERVOIR REGULATION SECTION

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Annual Report
on
Water Control Management
Water Year 1998
Los Angeles District
U.S. Army Corps of Engineers

A. Introduction. This report was prepared in accordance with the Engineering Regulation (ER) 1110-2-240, entitled “Water Control Management”, and dated 8 October 1982. The report summarized the Water Year 1998 water control management activities within the Los Angeles District (LAD) of the Corps of Engineers (COE). It also describes the accomplishments of the LAD’s Reservoir Regulation Section (RRS) personnel, reviews the status of ongoing changes associated with reservoir operations, data collection activities and procedures, and discusses the involvement of the RRS personnel in other COE activities.

B. Reservoir Projects and Flood Control System. The Los Angeles District (LAD) manages water control projects located in Southern California, Southern Nevada, and Arizona. Physically, the region has moderate to high relief, with arid and semi-arid valleys and basins separated by numerous high, but mostly small, mountain ranges. Some projects are associated with dense urbanization, where any heavy storm can cause large and rapid runoff. Runoff is very sporadic with all but a few streams being ephemeral. Violent floods occur rapidly, often within a few hours of heavy rain in areas of high relief. Only a few reservoirs have permanent impoundments; most remain empty except in response to flooding. A scarce natural water supply in the southwest U.S., coupled with a big demand makes all water within LAD an extremely valuable commodity. Consequently, some single purpose flood control reservoirs are sometimes operated to enhance local water conservation programs, within the framework of preserving their flood protection capabilities.

The LAD manages twelve gated and four ungated COE reservoirs. The LAD also directs the flood control regulation of four reservoirs managed by the Department of Interior. Table 1 presents pertinent data of each of these projects.

The LAD has constructed six ungated dams, all of which are now owned, operated, and maintained by local government agencies. These projects include Tahchevah, Dreamy Draw, Cave Buttes, Adobe, New River, and McMicken Dams. In addition, the LAD owns Salinas Dam a surplus military water supply project which is now operated by the City of San Luis Obispo for water supply purposes. Since management of these reservoirs had been transferred to local agencies, they are not addressed further in this report. The LAD has also completed improvements to Red Rock Detention Basin located on Red Rock Wash approximately 12 miles west of downtown Las Vegas in Nevada. The original detention basin was constructed by Clark County. The detention basin is

included in the COE's Las Vegas Wash (Tropicana-Flamingo) Project. LAD expects to transfer management of this project to Clark County in WY 1999.

1. Los Angeles and San Gabriel Rivers System. Rain floods in the Los Angeles and San Gabriel River watersheds in Southern California are controlled by seven COE reservoirs and sixteen locally owned reservoirs. Flows from the Rio Hondo and San Gabriel River co-mingle at the COE Whittier Narrows Dam which has outlets releasing into both rivers. Releases from the Rio Hondo outlet eventually flow into the Los Angeles River. Releases from the Whittier Narrows-San Gabriel outlet follow the natural course of the San Gabriel River to the Pacific Ocean. The other COE projects in this system are Lopez, Hansen, Sepulveda, Santa Fe, Brea, and Fullerton Dams. With hundreds of miles of improved high velocity channels draining an intensely developed watershed, these projects, together with locally owned reservoirs, comprise one of the most complex urban drainage systems in the United States. The total watershed area is 1449 square miles. The map of the overall Los Angeles and San Gabriel River System displaying the location of the COE projects is shown in Figure 1.

2. Santa Ana River System. Rain floods in the Santa Ana River watershed in Southern California are controlled by three COE reservoirs, with another one under construction, one local flood control reservoir, and seven local water supply reservoirs. The completed COE projects are San Antonio, Prado, and Carbon Canyon Dams. Seven Oaks Dam, designed to control flood waters in the upper Santa Ana River basin is currently at its last stage of construction. The total drainage area is 2,468 square miles. The map of the overall Santa Ana River Watershed (SAR) showing the location of the COE projects is shown in Figure 2.

3. Lower Colorado River System. Rain and snowmelt floods on the Lower Colorado River and its major tributaries are controlled by four Federal projects. Flood control criteria for the US Bureau of Reclamation's multi-purpose Hoover Dam and Modified Roosevelt Dam are specified by the LAD. The LAD projects are Alamo Dam and Painted Rock Dam. Eighteen additional large reservoir projects within the watershed influence water control operations. The Colorado River drains approximately 246,000 square miles at the Southerly International Boundary with Mexico. Flood control project locations for the Lower Colorado River system are shown in Figure 3.

4. Clover Creek System. Runoff from the Clover Creek watershed is controlled by two ungated COE projects. The two projects, Pine Canyon Dam and Mathews Canyon Dam, are located in a remote mountainous region in eastern Nevada. Although within the Lower Colorado River Watershed, these projects influence only local conditions related to the protection of the transcontinental railroad tracks at Caliente, Nevada. Clover Creek drains 340 square miles at its confluence with Meadow Valley Wash in Caliente, Nevada. These projects are shown in Figure 4.

5. Non-system Reservoir Projects.

a. In Arizona. Two reservoirs are located on tributaries to the Gila River in central Arizona. The COE Whitlow Ranch Dam controls runoff from the mountainous Queen creek watershed. The Bureau of Indian Affairs' Tat Momolikot Dam has flood control criteria specified by the LAD. It controls runoff from the arid Santa Rosa Wash watershed. Both projects are within the Lower Colorado River watershed; however, they only influence local conditions. These projects are shown in Figure 5.

b. In California. The COE ungated Mojave River Dam controls runoff from a mountainous watershed and releases flow into the Mojave River, which empties into a closed desert basin near Baker, California. The U.S. Bureau of Reclamation's Twitchell Dam controls runoff into the Santa Maria River, which drains into the Pacific Ocean. The LAD specifies the Twitchell Dam flood control criteria. Figure 6 shows the location of these two dams.

C. Water Control Management During Water Year 1998.

1. General. Water Year 1998 was an El Nino year which brought many storm series to Central and Southern California during the months of November 1997 thru May 1998 with short breaks in between. The total seasonal precipitation ranged between 29.47 inches and 67.89 inches in the Santa Ana River (SAR) Drainage Basin, between 30.19 inches and 44.66 inches in the Los Angeles County Drainage Area (LACDA), and 47.11 inches at Twitchell Dam in Central California. Total seasonal rainfall recorded in the SAR drainage basin is between 233% to 335% of normal, between 210% to 278% of normal in LACDA, and 277% of normal at Twitchell Dam for the Water Year.

Storm events in southern California required the RRS to operate most of its reservoirs for flood control purposes. Whittier Narrows Dam and Prado Dam were also operated for water conservation purposes. The two LAD projects in Arizona did not receive any significant inflow, however, minor flood control releases were made for a short period of time. Table 2 shows the Water Year 1998 provisional peak flow data of all the LAD projects including Section 7 projects owned by other Federal agencies for which LAD directs flood control regulation. Table 3 shows the monthly precipitation totals at all dams during Water Year 1998. The following paragraphs describe the operation of LAD projects and Section 7 projects during the Water Year.

2. Los Angeles River System.

a. Brea Dam. The El Nino storms began in early December 1997, but significant inflows into Brea reservoir did not occur until after the month of January. During the 6-8 February storm, inflows reached the annual peak of 2,400 cfs. These inflows resulted in a peak water surface elevation of 235.10 feet, m.s.l., and a maximum outflow of 1,600 cfs,

respectively. Flood control releases were also made during the 22-24 February storm, but the inflows and outflows from the dam were not as severe as the 6-8 February storm. Figure 7 shows Brea Dam's operation hydrograph during Water Year 1998.

b. Fullerton Dam. Since Fullerton Dam is in close proximity with Brea Dam, storm events have tendencies to have similar effects to both dams. Like Brea Dam, Fullerton Dam was also monitored and staffed with a dam tender during the storms of February, March and May. The estimated annual peak hourly inflow, peak hourly outflow and peak water surface elevation at Fullerton Dam occurred on 7 February and were recorded at 1,500 cfs, 400 cfs and 279.48 feet, respectively. Figure 8 shows Fullerton Dam's operation hydrograph during Water Year 1998.

c. Hansen Dam. Hansen Dam did not receive significant inflow until late February when Big Tujunga Dam, a Los Angeles County reservoir, exceeded its maximum storage capacity. The annual peak inflow to the reservoir occurred on 23 February at a rate of 8,000 cfs. The peak water surface elevation also occurred on the same day and was recorded at 1011.60 feet. The 22-24 February event also resulted in peak outflow of 8,200 cfs, which is the maximum during the entire water year. The dam was monitored and staffed with a dam tender during the succeeding storm events but major flood control releases were unnecessary. The operation of Hansen Dam during these events also provided incidental water conservation benefits to Los Angeles County. Figure 9 shows Hansen Dam's operation hydrograph during Water Year 1998.

d. Santa Fe Dam. Prior to the 23-24 February storm event, Santa Fe Dam did not receive major inflow to exceed the debris pool elevation of 456 feet. However, the reservoir received significant inflows starting on the 23-24 February storm event, when the upstream Los Angeles County Dams were nearly full. The annual peak inflow occurred on 24 February and was recorded at 11,200 cfs. Inflows during this event resulted in the annual peak water surface elevation of 458.59 feet and the annual peak outflow of 11,100 cfs. The operation of the dam during the water year also provided incidental water conservation benefits to Los Angeles County. Figure 10 shows Santa Fe Dam's operation hydrograph during Water Year 1998.

e. Sepulveda Dam. High inflows were received by the Sepulveda Dam reservoir from several storms that occurred from December 1997 through March 1998. The annual peak hourly inflow estimated to be 26,000 cfs occurred on 7 February. The annual peak water surface elevation and estimated instantaneous outflow also occurred on this day at 696.70 feet and 12,300 cfs, respectively. As a result of these storms, especially during the month of February, the Los Angeles Police Department had to close the roads located within the reservoir to vehicular traffic. Figure 11 shows Sepulveda Dam's operation hydrograph during Water Year 1998.

f. Whittier Narrows Dam. Whittier Narrows Dam was operated for flood

control and water conservation throughout most of the flood season. The annual maximum inflow occurred during the 6-8 February storm, when the estimated peak hourly inflow to the Rio Hondo side of the reservoir was recorded at 41,500 cfs. The maximum water surface elevation of 205.45 feet, m.s.l. occurred on 7 February, along with an estimated peak instantaneous outflow of 31,000 cfs. The San Gabriel side of the dam was also operated for flood control and also made some contribution towards water conservation. The 6-8 February storm resulted in a maximum hourly inflow of 54,000 cfs to the San Gabriel side of the dam. This inflow resulted in a maximum water surface elevation of 215.86 feet, m.s.l and a maximum outflow of 5,000 cfs, respectively. Figure 12 and Figure 13 show the operation hydrographs of the Rio Hondo side and San Gabriel side of the dam during Water Year 1998.

3. Santa Ana River System.

a. Carbon Canyon Dam. The storm events of 6-8 February and 22-24 February caused significant inflows into the Carbon Canyon reservoir, with the annual peak occurring on 23 February at an estimated rate of 1,100 cfs. On the same day, the water surface elevation reached a maximum of 427.21 feet, m.s.l. and the estimated peak outflow at 530 cfs. After the 22-24 February event, there were no other significant inflows into the reservoir. Figure 14 shows Carbon Canyon Dam's operation hydrograph during Water Year 1998.

b. Prado Dam. Storms in December 1997, January, February, and briefly in May 1998 resulted in reservoir impoundment behind the dam for water conservation that lasted throughout most of remainder of Water Year 1998. The 22-24 February storm resulted in large inflows into the reservoir, with the annual peak hourly inflow computed at 28,000 cfs. This inflow resulted in an annual peak water surface elevation of 514.29 feet, m.s.l. The maximum outflow rate of 5,000 cfs was released several times during the flood season. Figure 15 shows Prado Dam's operation hydrograph during Water Year 1998.

c. San Antonio Dam. San Antonio Dam was operated for flood control, as well as water conservation purposes during water Year 1998. Storms during February, especially on 22nd -24th, produced high inflows to the San Antonio Dam reservoir. These inflows, with an annual peak estimated at 830 cfs occurring on 25 February, resulted in a maximum water surface elevation of 2169.20 feet, m.s.l., and a maximum outflow of 1,280 cfs. After the major flood releases, the outflow rates were kept around to approximately 80 cfs in cooperation with the City of Pomona's water conservation efforts. The impoundment resulting from the storms in February through mid May allowed water conservation operation to continue through late August. Figure 16 shows San Antonio's operation hydrograph during Water Year 1998.

4. LAD's Arizona Projects. Table 4 shows the monthly precipitation totals at selected gages in Arizona and Nevada including Alamo and Painted Rock reservoirs

during Water Year 1998. Reservoir activities for these dams are shown on Figures 17 and 18.

a. Painted Rock Dam. Painted Rock Reservoir was mostly empty throughout the Water Year, except during a brief period after the flood season. During this period, the Salt River Project began making releases ranging from 1,000 cfs to 8,000 cfs on 10-12 April. The releases were made in response to SRP's Bartlett and Horseshoe Dams exceeding 90 percent of their total reservoir capacities. These releases resulted in inflows into the Painted Rock reservoir starting on 18 April, with the annual hourly peak estimated at 740 cfs, and an annual peak water surface elevation of 544.10 feet, m.s.l. The outflow rates from the dam were in excess of 1,000 cfs for a brief period.

b. Alamo Dam. Alamo Dam was operated in accordance with the recommended plan of the Bill Williams River Corridor Technical Committee (BWRCTC) Study. The lake elevation, which was at 1099.84 feet on 1 October, fluctuated between 1098 feet and 1100 feet until early February 1998. At that time, inflows from winter storms caused the lake elevation to rise to 1126.05 feet on 7 April. A "monsoon flush" release was initiated on that date and lasted until through 9 April. The peak outflow during this "monsoon flush" which is also the maximum for the entire water year was at a rate of 1000 cfs. The lake elevation, after the "monsoon flush" fluctuated between 1125 feet and 1127 feet before commencing a steady decline at the end of April.

5. Lower Colorado River System. Lake Mead began water year 1998 at elevation 1205.81 feet, with 29.769 million acre-feet (MAF). During the year, Lake Mead reached its maximum elevation of 1214.64 feet at the end of December, with 25.105 MAF in storage or 97% of capacity. Required flood control releases were made in January, February, and March 1998. With the reservoirs being full, the potential threat of El Nino, and showing required flood control releases in 1999, flood control releases made from Hoover Dam averaged about 20,000 cfs. The releases started on December 26, 1997 and ended March 31, 1998. A total of 1.14 MAF was released above downstream requirements during these three months.

6. Non-System Reservoir Projects - In California.

a. Twitchell Dam. The El Nino storm season resulted in one of the greatest flood events for the Santa Maria River basin in recent history. The inflow to Twitchell Reservoir, located on the Cuyama River, peaked at 17,000 cfs on 24 February. This was the largest peak ever recorded since record keeping began. Earlier in the same month, flows in the Santa Maria River caused a 600-foot breach in the river levee downstream from the City of Santa Maria. These flows were from runoff originating in the Sisquoc River, the other tributary to the Santa Maria River. No releases were being made from Twitchell Reservoir at the time. The Corps let an emergency contract to repair the breach which was completed by 24 February. Flood releases from Twitchell Reservoir

commenced on that date and incrementally increased up to 5,000 cfs by 27 February. The Twitchell Reservoir elevation peaked at 636.93 feet on 25 February (bottom of flood control pool is at elevation 623 feet). Reservoir activities at Twitchell Dam are shown on Figure 19. Discovery of an impending failure at another section of Santa Maria River levee, on 27 February, required curtailment of flood releases until 2 March, when necessary repair work was completed.

Santa Barbara County (SBC) and the Santa Maria Valley Water Conservation District (SMVWCD) requested the Corps for a deviation from normal flood operation to enable conservation of water in the flood control pool. SBC and SMVWCD specifically requested 25,000 acre-foot encroachment into the flood control for said purpose (up to elevation 632 feet). The requested was granted on 25 March. At the time that the request was granted releases from Twitchell Reservoir were at 400 cfs maximum. Releases were maintained at or below 400 cfs for the remainder of the WY 1998. On 12 September the reservoir water surface elevation dropped below 623 feet and, as a result responsibility for operational decisions reverted back to SMVWCD.

7. Water Conservation. Estimated amounts of water conserved by the operation of some LAD Reservoirs during Water Year 1998 are shown in Table 5.

8. Flood Damage Prevented During Water Year 1998. The total damages prevented by LAD flood control projects (including Section 7 projects) for Water Year 1998 amounted to \$1,979,380,000. Table 6 shows damages prevented by individual projects (separating Reservoir Projects from Levee Projects) in States of Arizona, California, and Nevada.

During the heaviest storm month of February, the Santa Maria Watershed in Central California had 7 storm events which resulted in a total precipitation of 16.07" at Twitchell Dam. The storm on 1-4 February brought 5.89" of precipitation to Twitchell Dam. Twitchell Dam and the Santa Maria Valley Levee system downstream of the dam prevented a total of \$24.44 million in damages during this storm event. The Corps levee project on the Santa Maria River prevented \$12.22 million in damages on 4 February when the peak flow of 29,500 cfs from the Sisquoc River reached Santa Maria River. Twitchell Dam prevented \$12.22 million in damages by holding back a peak flow of 16,150 cfs from the Cuyama River.

In the same month, Southern California was struck by 8 storm events which generated total precipitation amounts ranging from 12.07" to 20.18" at the LACDA projects, and between 12.67" to 22.03" in the SAR Drainage Basin. Several areas in Central and Southern California recorded highest precipitation on the recorded for the month. The LACDA and the SAR Drainage Basin are the major flood control projects which prevented the majority of the flood damages that would have otherwise occurred during the significant storm events in February.

D. Other Accomplishments During Water Year 1998.

1. Water Control Manuals.

a. Mathews Canyon Dam. The current approved manual is dated September 1975. A revised draft of water control manual has been completed in August 1998 and is currently under in-house review. This dam is ungated, therefore, there is no change in the water control plan.

b. Painted Rock Dam. The current approved manual is dated June 1962. This manual contains a nominal reservoir schedule that is seldom followed due to the lack of capacity in the downstream channel. A report entitled "Gila River, Gillespie Dam to Yuma, AZ - Reconnaissance Report", dated January 1995, documents a hydrologic study performed by the Hydrologic Engineering Section of the LAD and contains a water control plan that may be more appropriate to present conditions. In August 1998, a new area-storage capacity table was developed using the GIS information provided by the Corps' Cold Regions Research and Engineering Laboratories (CRREL). The update to the existing water control plan, which will be based on the new area-storage capacity table, is still in progress. The manual is scheduled to be completed in the next water year.

c. Prado Dam Interim Water Control Manual During Construction. Preparation of this manual began in May 1998. However, due to a budgetary issue, the start date of construction of the new outlet works will not commence until FY 2000. Preparation of the Prado Dam Interim Water Control Manual During Construction will continue in Water Year 1999 prior to start of construction.

d. Seven Oaks Dam Interim Water Control Manual. The current approved Interim Water Control Manual for Seven Oaks Dam is dated October 1994. The water control plan contained in this manual is based on diverting flows during construction. However, this plan does not address operating the dam and its features already in-place during large inflow events. With construction continuing through the 1999 flood season, an operation procedure that will both provide public safety and facilitate the remaining construction activities during the flood season was determined to be necessary. An addendum to the current Interim Water Control Manual During Construction which will contain such a plan is being prepared and scheduled for completion prior to the onset of the 1999 flood season.

e. Twitchell Dam. The draft Water Control Manual for Twitchell Dam was completed in April 1998 and had received preliminary comments for revisions. A revised water control plan, which will permit storage in the flood control pool for water conservation, has been conceptualized and is contained in the draft manual. However, completion of the revised manual was temporarily put on hold pending the possibility of a planning study which will re-evaluate the operation of the dam. The Santa Maria

Valley Water Conservation District will be the lead agency in the planning study, with the Corps, through the Reservoir Regulation Section, being one of the participating agencies.

f. Red Rock Dam Standing Operating Instructions. The RRS completed preparing the draft Red Rock Dam Standing Operating Instructions. This document will be forwarded to SPD for review and approval in early portions of Water Year 1999.

2. Studies and Reports.

a. Studies. The RRS participated in various studies during Water Year 1998, including the following: 1) LACDA Watercon Study which examines the possible expansion of water conservation operation at Whittier Narrows Dam and the formalization of water conservation operations at Santa Fe at Hansen Dams, 2) the San Antonio Reoperation Study which examines the current operation of the dams and other alternative means of operating the dam, 3) the Prado Dam Water Conservation Study which examines the expansion of water conservation operation at Prado Dam, and 4) the Alamo Dam Feasibility Study which is being conducted to implement an operation plan that improves flood control while at the same time allows environmental restoration.

b. Annual Reports and Publications. The RRS publishes annual reports, including this report, summarizing RRS's water control and other related activities during the previous water year. The other reports include: 1) the Annual Water Quality Management Report, 2) the Annual Water Control Management Report (this report), 3) the Annual Flood Damages Prevented Report, and 4) the Water Control Data System Master Plan. All reports covering WY 1997, were completed in WY 1998 and submitted to SPD within their designated deadlines. The RRS also prepares an annual publication entitled "Instructions for Reservoir Operation Center Personnel", also known as the Orange Book, which outlines necessary information for reservoir regulation. During Water Year 1998, the Orange Book was completed in prior to the start of the 1999 flood season.

c. Dam Safety Inspections. During Water Year 1998, the RRS participated in the periodic safety inspection of Mojave Dam and related dam safety inspection of Prado Dam. The RRS plans to continue participation in this program in Water Year 1999. The RRS may also be asked to participate in the periodic inspection of Section 7 projects.

d. Engineering Plans Reviews. During Water Year 1998, the RRS reviewed engineering plans mostly regarding development proposals in reservoir areas, including Whittier Narrows, Prado, Sepulveda, Lopez, Fullerton, Carbon Canyon, and Brea Reservoirs, and AJO Detention Basin

e. Miscellaneous. The RRS keeps a list of agencies and contractors that

temporarily restricts the operation of projects. A temporary restriction is a short term condition which requires coordination before any gate changes are made at an upstream LAD reservoir. Common examples of restrictions include construction activity, water sampling, inspections and channel maintenance. During Water Year 1998, the RRS updated its Restriction Lists as necessary. The Water Control Handbook which is used during flood operations was also updated as necessary during Water Year 1998.

3. Water Control Data System

a. Workstation Upgrade: This past winter was the first real test of LAD's SUN SPARC 20 based WCDS system. Thoroughly tested during this busy El Nino year, the newly configured system performed very well. The old CD4330 workstations were returned to Control Data in late FY97 as part of the workstation exchange program.

b. Southern California Line-of-Sight Radio Telemetry System: A replacement central control computer system has been successfully developed by in-house staff to support operation of LAD's Southern California telemetry stations. The system controls polling of 74 stations collecting and reporting data from 108 reservoir level, stream level, precipitation, and temperature measuring devices.

One new station is being installed: San Antonio Creek above Chino Creek. Installation of this station will be completed Fall 1998.

c. Arizona/Nevada/California GOES Telemetry System: Following several months of disappointing performance from a commercially manufactured DOMSAT system, LAD successfully built a new DOMSAT. The new DOMSAT has proven to be extremely reliable. The system collects, processes, and stores data in HECDSS from LAD's 27 GOES DCPs located in Arizona, Nevada, and California and from about 50 non-Corps DCPs. A second DOMSAT will be configured in FY99 and located in the planned backup Reservoir Operation Center (ROC).

One new GOES DCP was installed (Twitchell Dam, CA), another DCP was removed because equipment security concerns (Tat Momolikat Dam, AZ), and plans are being made to install a new DCP at an existing stream gage located above Mojave River Dam, CA.

d. Collection of Real-Time Weather Information: LAD subscribed to a satellite based weather information service from Data Transmission Network Corporation (DTN) which provides easy access to the latest satellite and radar images. It also serves as a backup source for the latest watches and warnings issued by the National Weather Service.

e. NEXRAD Data Collection: In March 1998, LAD requested and then received permission from SPD to shutdown the two NEXRAD PUIEs it operated. Up until that time, LAD functioned as the NEXRAD data collection site for SPD. As such

LAD had overall responsibility for collecting and disseminating NEXRAD data within SPD. Each district office, however, was given responsibility for installing telephone lines to the individual radar sites located within their own district boundaries. From the fall of 1995 through March of 1998, LAD used the two PUIEs to collect Stage I radar data from 6 sites in LAD. No other SPD districts elected to participate in the project. Because Stage I data proved to be of little use to LAD and the other districts in SPD, it was determined that the PUIEs could be shut down and that the phone lines to the radar sites could be canceled.

f. Internet/Intranet: A Windows NT and Sun Microsystem-based intranet site became operational. This site provides access to real-time telemetry data, National Weather Service and contractor supplied weather data, historical operation data, project information, daily reports, and other pertinent information. An internet site has been established on the web server which exists outside of the district firewall. This external server receives near real-time telemetry and weather data updates from the primary WCDS and is thereby capable of providing access to telemetry, weather, project, and other data to external users.

g. GIS: . A work order was given to CRREL for assistance in and utilization of the GIS software. CRREL traveled to LAD and installed their CorpView GIS application which links on-screen maps and graphics to HECDSS databases of telemetry data. CRREL also performed an analysis of storage at Painted Rock Reservoir using Landsat images of the reservoir taken during drawdown periods following the high water years of 1993 and 1995. The analysis helped to quantify the amount of reservoir storage loss due to sediment deposition during the historic flood of 1993 and the smaller but also significant inflows of 1995.

h. Reservoir Regulation Web Site: The Reservoir Regulation Section web site was extensively revised and updated. Web users now have easier and more comprehensive access to real-time telemetry data, current reservoir status, basin maps, and project information. This is still an on-going project and we plan on further improving the web site in FY1999. Planned improvements include: access to historical reservoir operation data, improved basin maps, and online dissemination of water control manuals.

4. Meetings Attended Concerning Reservoir Regulation Activities: Members of the RRS attended meetings and conferences related to reservoir regulation activities, including the following:

- S Annual pre-storm season meeting with L.A. County Dept. of Public Works (LACDPW)
- S Annual pre-storm season meeting with Orange County agencies
- S Annual pre-flood season in-house training
- S Colorado River Basin Forecasting Center Status meeting

- S LACDA Watercon Audit at LAD
- S Meeting with OCWD and USFWS regarding Water Conservation at Prado Dam
- S F-4 meeting regarding Alamo Feasibility Study
- S F-4 meeting regarding San Antonio Dam reoperation
- S AFB meeting regarding Alamo Feasibility Study
- S Numerous LACDA Watercon meetings
- S Numerous Seven Oaks meetings regarding the water control operation plan for the 1999 flood season
- S Meetings with regarding additional water conservation at Prado reservoir.
- S Meetings with the L.A. City Parks and Recreation (Park Rangers), LAPD, LAFD, California Highway Patrol, and LA City Emergency Preparedness Section (City Public Works) regarding Sepulveda basin notification and evacuation procedures
- S Field reconnaissance meeting at Twitchell Dam
- S Meeting with U.S. Bureau of Reclamation in Sacramento regarding Twitchell Dam operation and maintenance transfer and repayment contract
- S Initial meeting of the Alamo Dam and Lake Feasibility Study
- S Water Quality Seminar in Kansas City, Missouri
- S Meeting in Santa Maria Vicinity to discuss issues surrounding the operation of Twitchell Dam and reservoir
- S Meeting in LAD with Office of Counsel to discuss Corps responsibility in the environmental issues surrounding the UNOCAL operation at the mouth of the Santa Maria River
- S Alamo Dam and Lake Feasibility Study Pre-F4 and F4 meetings in LAD
- S Meeting in Santa Maria regarding development of Twitchell Dam and Reservoir Emergency Action Plan, initiated by the U.S. Bureau of Reclamation
- S Alamo Dam and Lake Alternative Formulation Briefing tele-conference meeting
- S Numerous meetings with consultants regarding development proposals with reservoir projects
- S Meeting regarding Multi-Species Conservation Plan (MSCP) effort currently underway for the lower Colorado River
- S Meeting with IM to discuss rollout of Windows NT as the District's network operating system and its impact on Water Control
- S Meetings with IM concerning Year 2000 issues

5. Seminars and Training Courses. Seminars and training courses attended by RRS staff members during WY 1998 include the following:

- S SPD H&H Workshop in Albuquerque
- S Introduction to GIS at CRREL
- S Environmental Laws and Regulations
- S HEC-HMS Course at HEC in Davis
- S Hydrologic Data Management (HEC-DSS)
- S Powerpoint presentation in LAD

- S CEFMS Training
- S Mid Career Retirement Seminar
- S Pre-Retirement Planning Seminar

Table 9 shows the chain of command for reservoir decisions in the Los Angeles District. A list RRS personnel as of the end of the Water Year is show in Table 10, and RRS's funding for water control activities is shown in Table 11.

6. Status of Y2K Compliance. Appendix A contains a Memo sent to SPD outlining the status of LAD's Water Control Data System's Y2K compliance.

Table 1
Pertinent Data for Flood Control Reservoirs Los Angeles District, U.S. Corps of Engineers

Project	Stream	Completion Date	Drainage Area (sq-mi)	Capacity (ac-ft)	Maximum Scheduled Release (cfs)	Outlet Type ¹	Flood Control	Water Conservation	Hydropower	Recreation
LACDA SYSTEM										
Brea	Brea Creek	1942	22	4,009	1,500	G & U	X			
Fullerton	Fullerton Creek	1941	5	760	500	G & U	X			
Hansen	Tujunga Creek	1940	147	30,845	20,800	G & U	X			
Lopez	Pacoima Wash	1954	34	212	422	G	X			
Santa Fe	San Gabriel River	1949	236	30,887	41,000	G	X			
Sepulveda	Los Angeles River	1941	152	17,425	16,500	G & U	X			
Whittier Narrows	Rio Hondo River & San Gabriel River	1957	554	34,947	45,250 ⁵	G	X	X		
SANTA ANA RIVER SYSTEM										
Carbon Canyon	Carbon Creek	1961	19	6,615	1,000	G	X			
Prado	Santa Ana River	1941	2,255	187,700	5,000	G	X	X		
San Antonio	San Antonio Creek	1956	27	8,535	8,000	G	X			
LOWER COLORADO RIVER SYSTEM										
Alamo	Bill Williams River	1968	4,770	1,046,314	7,000	G	X	X		X
Hoover ²	Colorado River	1935	167,740	27,377,000	40,000	G	X	X	X	
Painted Rock	Gila River	1960	50,800	2,492,000	22,500	G	X			
CLOVER CREEK SYSTEM										
Mathews Canyon	Mathews Canyon Wash	1957	34	6,271	260	U	X			
Pine Canyon	Pine Canyon Wash	1957	45	7,747	322	U	X			
NON-SYSTEM RESERVOIRS										
Mojave River	Mojave River	1971	215	89,669	23,500	U	X			X
Tat Momolikt ³	Santa Rosa Wash	1974	1,780	198,545	4,960	G & U	X	X		X
Twitchell ⁴	Santa Maria River	1958	1,132	265,399	12,700	G	X	X		
Whitlow Ranch	Queen Creek	1960	143	35,593	1,007	U	X			

1. G: Gated Outlets; U: Ungated Outlets

2. Physically operated by the U.S. Bureau of Reclamation, Department of the Interior. Corps of Engineers directs flood control operation under Section 7 authority of 1944 Flood Control Act.

3. Operated by Bureau of Indian Affairs. Corps of Engineers directs flood control operation under Section 7 authority of 1944 Flood Control Act.

4. Physically operated by the Santa Maria Water Conservation District (SMWCD). U.S. Bureau of Reclamation (USBR) is charged with the responsibility for the actual flood-control operation directed by the Corps of Engineers under Section 7 authority of 1944 Flood Control Act. The operation and maintenance of the dam were transferred to the Santa Barbara County Water Agency from USBR by contract, which was in turn transferred to the SMWCD.

Table 2. WY 98 Provisional Reservoir Flow Data, LAD Projects

Project	Average	Max Capacity (ac-ft)	Elevation at Max Capacity (ft)	WY 98 Storage		WY 98 Total Inflow		Peak Inflow		Peak Outflow				
	Annual Inflow (ac-ft) ³			Percent Capapcity Utilized (%)	Elevation at Matx Storage (ft, MSL)	Volume (ac-ft)	Percent of Average Annual (%)	Peak Mean Hourly (cfs)	Percent D/S Channel Capacity (%)	Peak Mean Hourly (cfs)	Percent of Peak Inflow (%)	Peak Inst. (cfs)	Percent of D/S Channel Capacity (%)	Max D/S Channel Capacity (cfs)
LACDA SYSTEM														
Brea	10,400	4,020	280	7	235.10	43,500	418	2,400	120	1,600	67	1,600	80	2,000
Fullerton	4,800	763	290	35	279.48	6,600	136	1,500	300	380	25	400	80	500
Hansen	73,800	25,450	1,060	10	1,011.60	143,000	138	8,000	38	8,200	103	8,200	29	21,000
Lopez	12,100	440	1,273	115	1,274.50	49,500	550	820	7	790	96	1,060	10	11,000
Santa Fe	40,500	32,100	496	16	458.59	152,000	385	11,200	27	11,100	99	11,100	27	41,000
Sepulveda	81,000	1,740	710	26	696.70	289,000	359	26,000	153	12,500	48	12,300	30	17,000
WN - Rio Hondo ¹	130,000	19,500	229	18	205.45	252,000	184	41,500	114	31,000	75	31,000	85	36,500
WN - San Gabriel ¹	110,000	15,600	229	21	215.86	296,000	271	54,000	415	5,000	9	5,000	38	13,000
SANTA ANA RIVER SYSTEM														
Carbon Canyon	1,900	6,600	475	9	427.21	7,800	407	1,100	110	530	48	530	53	1,000
Prado ¹	219,000	196,000	543	26	514.29	424,000	193	38,000	81	5,000	13	5,000	11	47,000
San Antonio ¹	14,600	8,535	2,238	15	2,169.20	22,100	151	830	10	110	13	1,282	16	8,000
LOWER COLORADO RIVER SYSTEM														
Alamo	140,900	995,300	1,235	17	1,126.58	102,000	72	3,800	380	1,010	27	1,010	100	1,000
Hoover ¹	11,900,000	27,377,000	1,229	92	1,214.78	14,700,000	124	58,000	145	29,600	51	29,600	74	40,000
Painted Rock	600,000	2,491,493	661	1	544.10	8,960	1	740	7	210	28	1,330	13	10,000
CLOVER CREEK SYSTEM														
Mathews Canyon	460	6,270	5,461	14	5,435.06	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	3,000
Pine Canyon	1,200	7,750	5,671	5	5,622.34	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	3,000
NON-SYSTEM RESERVOIRS														
Mojave River	60,355	89,669	3,134	3	3,027.07	N/A	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	30,000
Tat Momolikot	N/A ⁴	198,547	1,539	N/A ⁴	N/A ⁴	400	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	5,000
Twitchell	34,921	240,120	651	65	636.93	304,000	869	17,000	11	5,000	29	5,000	3	160,000
Whitlow Ranch	N/A ⁴	35,593	2,166	0	2,069.31	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	N/A ²	1,000

FOOTNOTES:

- 1. Project is also operated for watercon purposes
- 2. N/A - data not available
- 3. Average Annual Inflow - LAD's Rascal 1976-1998

**Table 3. Observed Southern California Precipitation (inches)
1998 Water Year**

Station	Elev (ft)	Drainage Basin	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Normal	% Normal
Brea Dam	280	LACDA	0.01	2.25	4.19	3.09	12.80	4.39	0.55	2.90	0.01	0.00	0.00	0.00	30.19	11.43	264
Chatsworth Res	910	LACDA	0.00	3.03	5.36	2.76	17.00	4.48	1.17	4.32	0.07	0.00	0.00	0.12	38.31	14.00	274
Fullerton Dam	340	LACDA	0.00	2.87	4.20	3.09	15.05	4.55	0.72	3.40	0.07	0.00	0.00	0.00	33.95	12.91	210
Hansen Dam	1100	LACDA	0.00	2.28	3.45	2.53	12.07	4.36	0.73	3.37	0.19	0.00	0.00	0.38	29.36	13.77	213
San Fernando Powerhouse	1250	LACDA	0.00	3.76	5.21	3.63	20.18	5.19	0.85	5.44	0.23	0.00	0.00	0.15	44.64	16.88	264
Santa Fe Dam	430	LACDA	0.00	2.67	3.24	4.25	15.02	4.91	0.77	4.47	0.09	0.01	0.04	0.00	35.47	15.03	236
Sepulveda Dam	670	LACDA	0.00	2.65	5.17	2.76	17.78	5.71	1.11	3.57	0.10	0.00	0.00	0.08	38.93	14.39	271
Whittier Narrows Dam	240	LACDA	0.00	2.65	3.91	4.80	15.64	4.57	1.09	4.14	0.02	0.00	0.00	0.02	36.84	13.24	278
Carbon Canyon-Workman	1180	SAR	0.03	2.29	3.18	3.74	12.84	3.56	0.56	3.25	0.00	0.00	0.02	0.00	29.47	12.63	233
Prado Dam	560	SAR	0.00	2.08	5.10	3.03	16.37	4.44	0.61	4.08	0.09	0.00	0.06	0.01	35.88	11.67	307
Running Springs	5970	SAR	2.46	5.56	4.50	6.29	22.03	9.95	6.65	8.43	0.28	0.16	1.24	0.34	67.89	27.73	245
Etiwanda	1390	SAR	0.01	2.94	2.49	4.89	18.45	4.58	0.99	4.41	0.05	0.00	0.05	0.00	38.86	16.44	236
Orange County Res	660	SAR	0.00	2.47	3.92	3.47	13.66	4.04	0.59	2.80	0.09	0.00	0.03	0.19	31.26	13.35	234
Santiago Dam	855	SAR	0.00	2.17	7.35	2.40	12.67	5.17	0.81	3.17	0.10	0.00	0.01	0.40	34.25	10.21	335
Silverado Ranger Station	1095	SAR	0.04	2.70	7.99	3.47	16.98	4.67	1.05	3.63	0.18	0.00	0.01	0.61	41.33	14.90	277

**Table 4. Observed Arizona/Nevada Precipitation (inches)
1998 Water Year**

Station	Drainage	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Normal	% Normal
Alamo Dam	Bill Williams	0.20	0.06	1.71	0.52	2.46	0.51	0.16	0.11	0.00	2.34	0.80	0.89	9.76	5.21	187
Wikieup, AZ	Bill Williams	0.00	0.41	1.70	0.86	3.56	0.97	0.62	0.28	0.00	2.53	1.92	0.72	13.57	10.32	132
Bagdad, AZ	Bill Williams	0.00	0.43	2.23	1.44	4.95	1.94	0.96	0.57	0.00	2.49	2.34	1.43	18.78	4.89	384
Painted Rock Dam	Gila River	m	m	1.37	0.09	2.11	m	m	0.01	0.00	0.76	1.61	0.69	n/a	5.47	-
Gillespie Dam	Gila River	0.16	0.02	1.03	0.10	2.84	0.87	0.26	0.01	0.00	1.99	0.83	0.19	8.30	n/a	-
Pine Canyon Dam	Gila River	0.24	0.62	0.31	0.26	1.97	0.90	0.56	0.37	0.61	1.79	3.85	3.43	14.91	9.11	1.64

Notes:

1. m - Missing data
2. n/a - Data not available

**Table 5. Estimated Water Conserved in LAD Reservoirs
Water Year 1998**

<u>Name of Dam</u>	<u>WY 1998 (ac-ft)</u>
Whittier Narrows ¹	13,730
Santa Fe ¹	19,197
Prado ²	230,000
San Antonio ³	22,500
TOTAL	285,427

Note:

1. Source: Los Angeles County Department of Public Works, Dam and Spreading Grounds Operation
2. Source: Orange County Water District
3. Source: Los Angeles District, Corps of Engineers

Table 6. Annual Flood Damages Prevented by LAD Projects in FY 1998

In California		In Arizona		Section 7 Projects	
Name of Project	Damages Prevented (In \$1,000)	Name of Project	Damages Prevented (In \$1,000)	Name of Project	Damages Prevented (In \$1,000)
LACDA Channels	268,600	Alamo Dam	0	Hoover Dam & Lake Mead	13,662
Hansen Dam	42,976	Allenville	N/A	Santa Maria Valley Levees/Twitchell Dam & REs	12,220 / 12,220
Lopez Dam	10,744	Holbrook Levee	N/A	Santa Rosa Wash (Tat Momolikot Dam & Lake St. Clair)	0
Santa Fe Dam	96,696	Mathews Canyon Dam	N/A	Modified Roosevelt Dam	0
Sepulveda Dam	333,064	Painted Rock	0		
Whittier Narrows Dam	590,920	Pine Canyon Dam	N/A		
Devil, Est Twin, & Warm Creeks Channels	22,669	Trilby Wash Detention Basin/Outlet Channel	N/A		
Mill Creek Levees	33,465	Tucson Diversion Channel	N/A		
Riverside Levees	2,159	Whitlow Ranch Dam	N/A		
San Jacinto Levees * Bautista Creek Channels	4,318	Winslow: Ruby Wash Diversion Channel	N/A		
Brea Dam	12,957	INdia Bend Wash	N/A		
Carbon Canyon Dam/Channel	5,874 / 2,764	Adobe Dam	N/A		
Fullerton Dam	17,276	Cave Buttes Dam	N/A		
Lytle & Cajon Creeks Channel Improvements	45,339	Dreamy Draw Detention Basin	N/A		
Proado Dma	384,391	New River Dam	N/A		
San Antonio Dam/Channel, Chino Creek	8,638 / 0				
Banning Levee	N/A				
Chino Canyon Improvements	N/A				
City Creek Levee	N/A				
Lytle and Warm Creeks	N/A				
Mojave River Dam	N/A				
Needles	N/A				
Oro Grande Wash Channel	N/A				
Quail Wash Levee	N/A				
Rose Creek Channel	N/A				
San Diego River Levee	N/A				
Santa Clara River Levee	N/A				
Stewart Canyon Debris Basin/Channel Improvements	N/A				
Tijuana Rlver Basin	N/A				
Sespe Creek	9,828				
Santa Paula Creek	48,600				
TOTAL	1,941,278		0		38,102

Note:

1. N/A - Not enough Information available to estimate damages prevented. However, the damages prevented by all the major district project were accounted for.
2. The flood damages prevented by Hoover Dam in FY 98 provided by the USBR office is only a preliminary estimate since the USBR office prepares its Annual Flood Prevention Report at the beginning of the calendar year.

A peak flow of 57,700 cfs (roughly equivalent to \$13,662,000 in damages prevented) at Hoover Dam was calculated by assuming the upper Colorado Reservoir system does not exist.

**Table 7. WY 1998 Colorado River Data
Lake Mead and Lake Powell Data**

First Date of the Month	1 Lake Mead & Upstream Reservoirs space available (1,000 ac-ft)	2 Forecasted April-July Mean Inflow MAF %Ave		1 Lake Mead Storage (1,000 ac-ft)	3 Lake Mead Space Available (1,000 ac-ft)	1 Hoover Dam Release (cfs)
Jan-98	6,101.4	6.6	85%	25,122	2,255	13,000
Feb-98	6,887.6	6.9	89%	25,069	2,308	16,200
Mar-98	7,542.4	7.4	96%	25,023	2,354	16,700
Apr-98	7,876.9	6.8	88%	25,043	2,334	21,900
May-98	7,502.7	7.7	100%	24,810	2,567	18,100
Jun-98	5,573.6	7.7	100%	24,626	2,751	21,000
Jul-98	4,240.4	8.255	107%	24,671	2,706	18,500

Note:

1. Source: Daily Report on Lower Colorado River Reservoir System from USBR Lower Colorado Region, Boulder City, Nevada.
2. Source: National Weather Service, Aalt Lake City Office.
3. Lake Mead Maximum Storage (2,377,000 ac-ft) subtract Lake Mead Storage.

Table 8. STATUS OF WATER CONTROL MANUALS AND PLANS

PROJECT	OWNER	CURRENT APPROVED DOCUMENT	SCHEDULED DATE OF COMPLETION
<u>WATER CONTROL MANUALS</u>			
ALAMO DAM	COE	APR 73	SEP 1999
BREA DAM	COE	BEF 90	FEB 2002
CARBON CANYON DAM	COE	MAR 90	MAR 2001
FULLERTON DAM	COE	JUN 89	JUN 2000
HANSEN DAM	COE	SEP 90	SEP 2001
HOOVER DAM	USBR	JAN 84	Unscheduled
LOPEZ DAM	COE	JAN 86	SEP 2001
MODIFIED ROOSEVELT DAM	USBR	APPROVED 21 NOV 96	SEP 2006
PAINTED ROCK DAM	COE	NOV 62 - original manual	SEP 1999
PRADO DAM	COE	SEP 91	Unscheduled
SAN ANTONIO DAM	COE	SPE 92	SEP 2002
SANTA FE DAM	COE	OCT 67	SEP 2003
SEPULVEDA DAM	COE	JUN 89	SEP 2002
SEVEN OAKS DAM	COE	Dam under construction	AUG 2001
TAT MOMOLIKOT DAM	BIA	SEP 92	SEP 2003
TWITCHELL DAM	USBR	AUG 60	Unscheduled
WHITTIER NARROWS DAM	COE	DEC 57	SEP 2004
<u>WATER CONTROL PLANS</u>			
MATHEWS CANYON DAM	COE	SEP 75	APR 1999
MOJAVE DAM	COE	SJAN 86	SEP 1999
PINE CANYON DAM	COE	DEC 74	Unscheduled
WHITLOW RANCH DAM	COE	OCT 85	SEP 2000
<u>STANDING INSTRUCTION FOR PROJECT OPERATOR FOR WATER CONTROL</u>			
LYTLE CREEK INLET	SBCFCD	OCT 90	SEP 2002

**Table 9. Chain of Command for Reservoir Operation Decisions
Corps of Engineers, Los Angeles District**

Title
District Engineer

Office Phone Number
(213) 452-3861

WATER CONTROL DECISIONS

Title	Phone No.
Chief, Engineering Division	(213) 452-3629
Chief, Hydrology & Hydraulic Branch	(213) 452-3525
Chief, Reservoir Regulation Section	(213) 452-3527
Chief, Reservoir Regulation Unit	(213) 452-3530

OPERATIONS and MAINTENANCE

Title	Phone No.
Chief, Construction & Operations Division	(213) 452-3349
Chief, Operations Branch	(213) 452-3385
Chief, Operations and Maintenance Section	(626) 401-4008
Dam Tender Foreman	(626) 401-4006

**Table 10. Reservoir Regulation Section Personnel
December 1998**

Name	Phone	Title	
Brian Tracy	(213) 452-3530	Supv. Hydraulic Engineer	GS-0810-13
Water Control Data Unit			
Gregory Peacock	(213) 452-3536	Hydraulic Engineer	GS-0810-12
Robert Kuboshige	(213) 452-3584	Hydraulic Engineer	GS-0810-11
Don Queen	(213) 452-3531	Computer Specialist	GS-0810-11
Daniel Downing	(626) 401-4032	Hydrologic Technician	GS-1316-11
Tetsuya Kakimoto	(626) 401-4029	Hydrologic Technician	GS-1316-09
Christopher Craig	(626) 401-4028	Hydrologic Technician	GS-1316-09
Carlos Pedroza	(626) 401-4030	Hydrologic Technician	GS-1316-09
Darius Wallace	(626) 401-3569	Hydrologic Technician	GS-1316-07
Reservoir Regulation Unit			
Melvin Meneses	(213) 452-3530	Hydraulic Engineer	GS-0810-12
Wendy Luo	(213) 452-3532	Hydraulic Engineer	GS-0810-11
Robert Stuart	(213) 452-3481	Hydraulic Engineer	GS-0810-11
Moon-Hee Kim	(213) 452-3533	Hydraulic Engineer	GS-0810-09
Michael Bello	(213) 452-3535	Hydrologic Technician	GS-1316-07

* Fox and Allied Weather Services were the meteorology contractors for the RRS during WY 1998.

Table 11.
O&M Funding Information for Water Control Activities

Purpose	FY 1998 (Actual)	FY 1999	FY 2000
Labor, incl. Overtime	\$865,534	\$1,013,000	\$1,043,000
Indirect and Overhead	\$773,355	\$905,000	\$932,000
Equipment Purchases, Materials, Travels, Reproduction, Facility Charges, and Mainenance	\$376,947	\$251,940	\$370,000
Environmental Studies	\$74,600	\$74,600	\$85,000
SPD Funding	\$228,848	\$225,000	\$250,000
Cooperative Streamgaging Program	\$163,980	\$180,460	\$180,000
Total	\$2,483,264	\$2,650,000	\$2,860,000

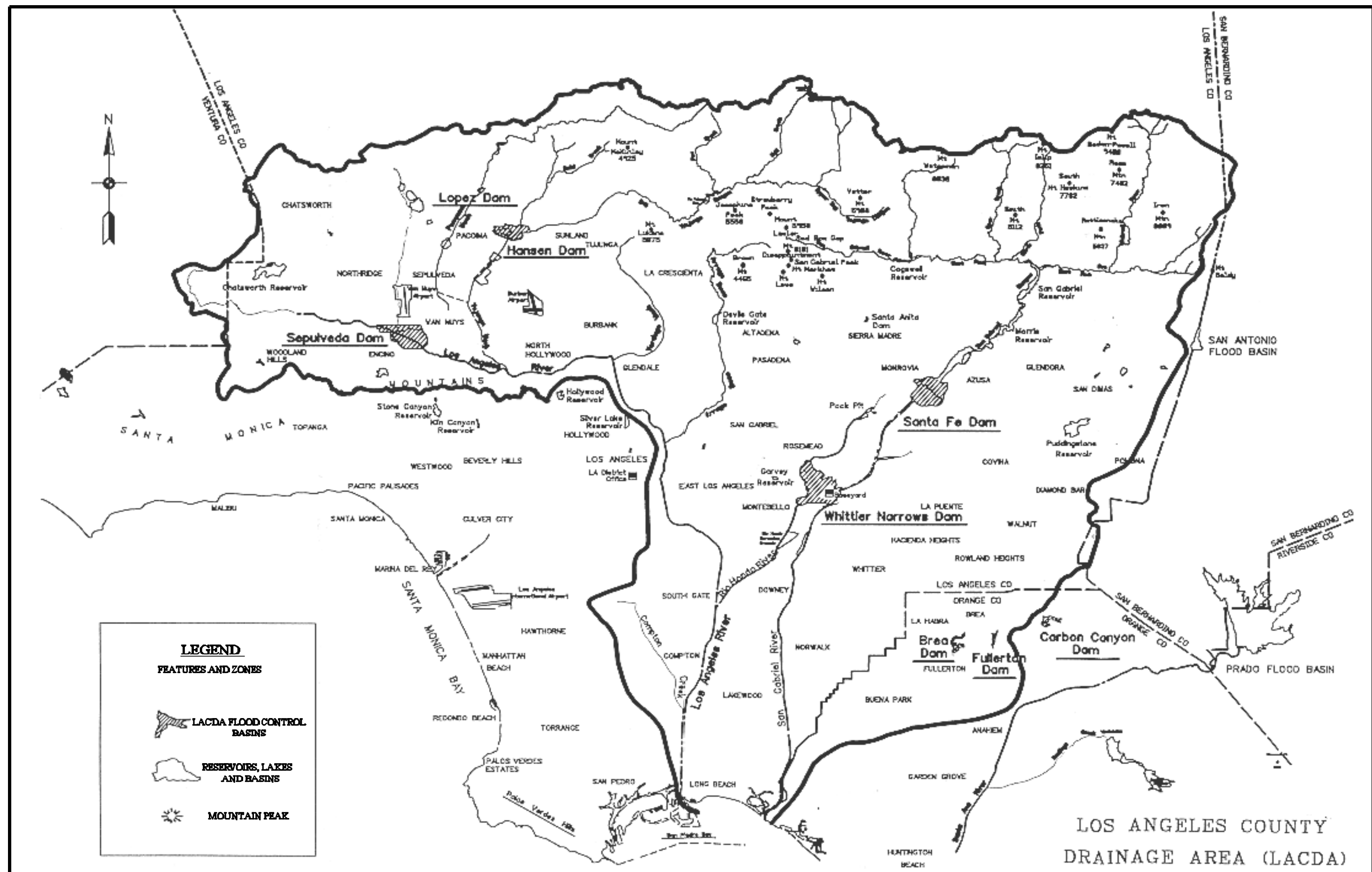


FIGURE 1

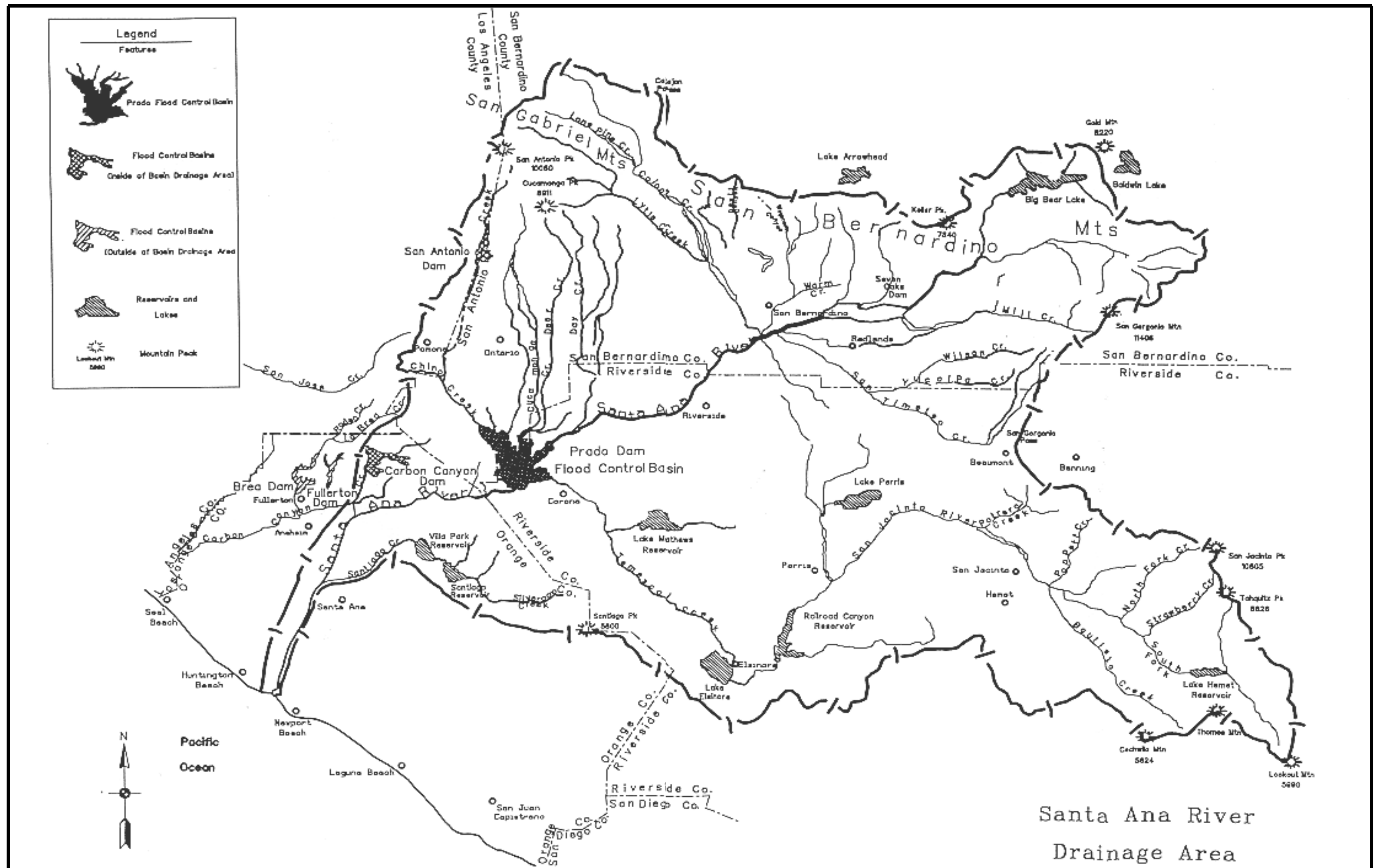


FIGURE 2

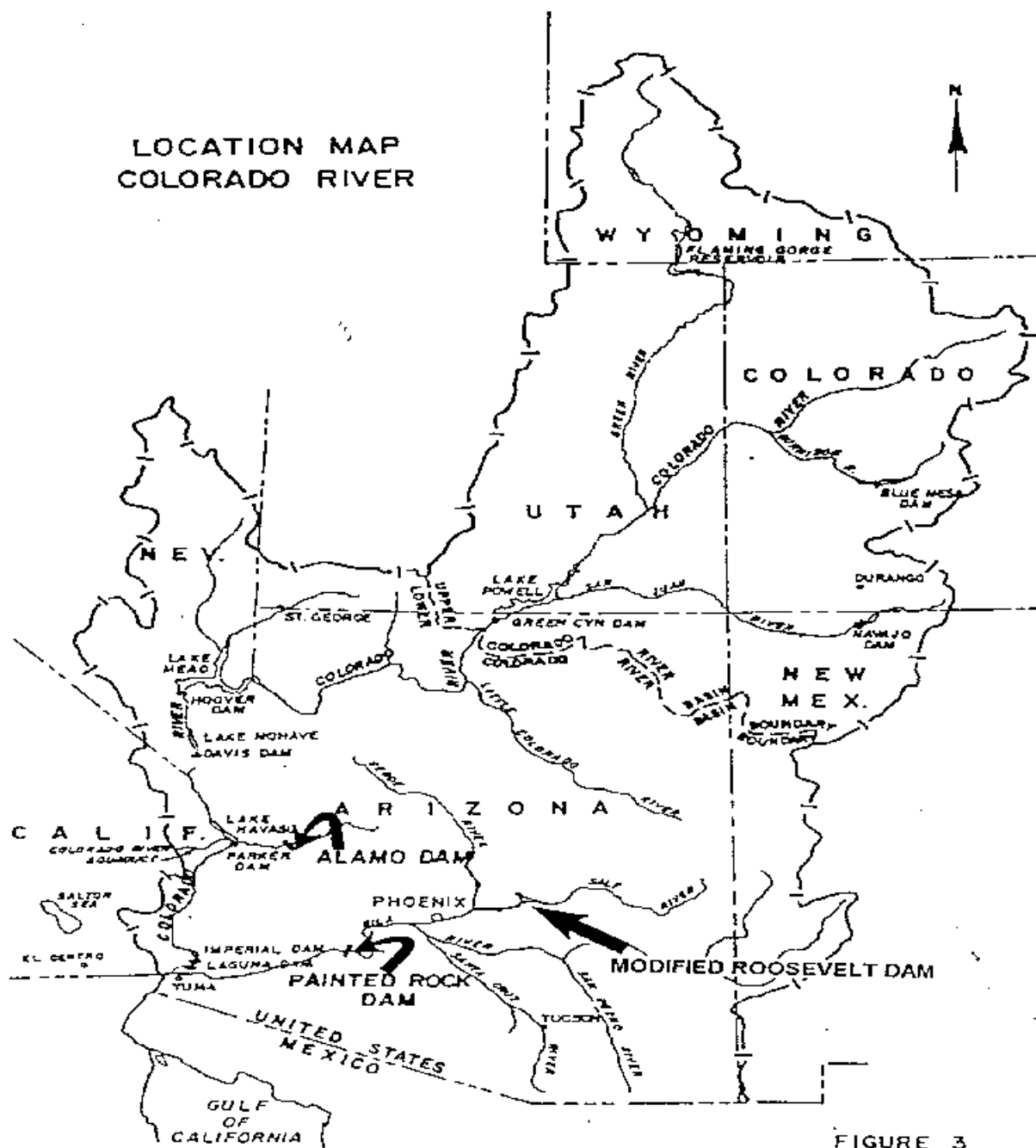


FIGURE 3

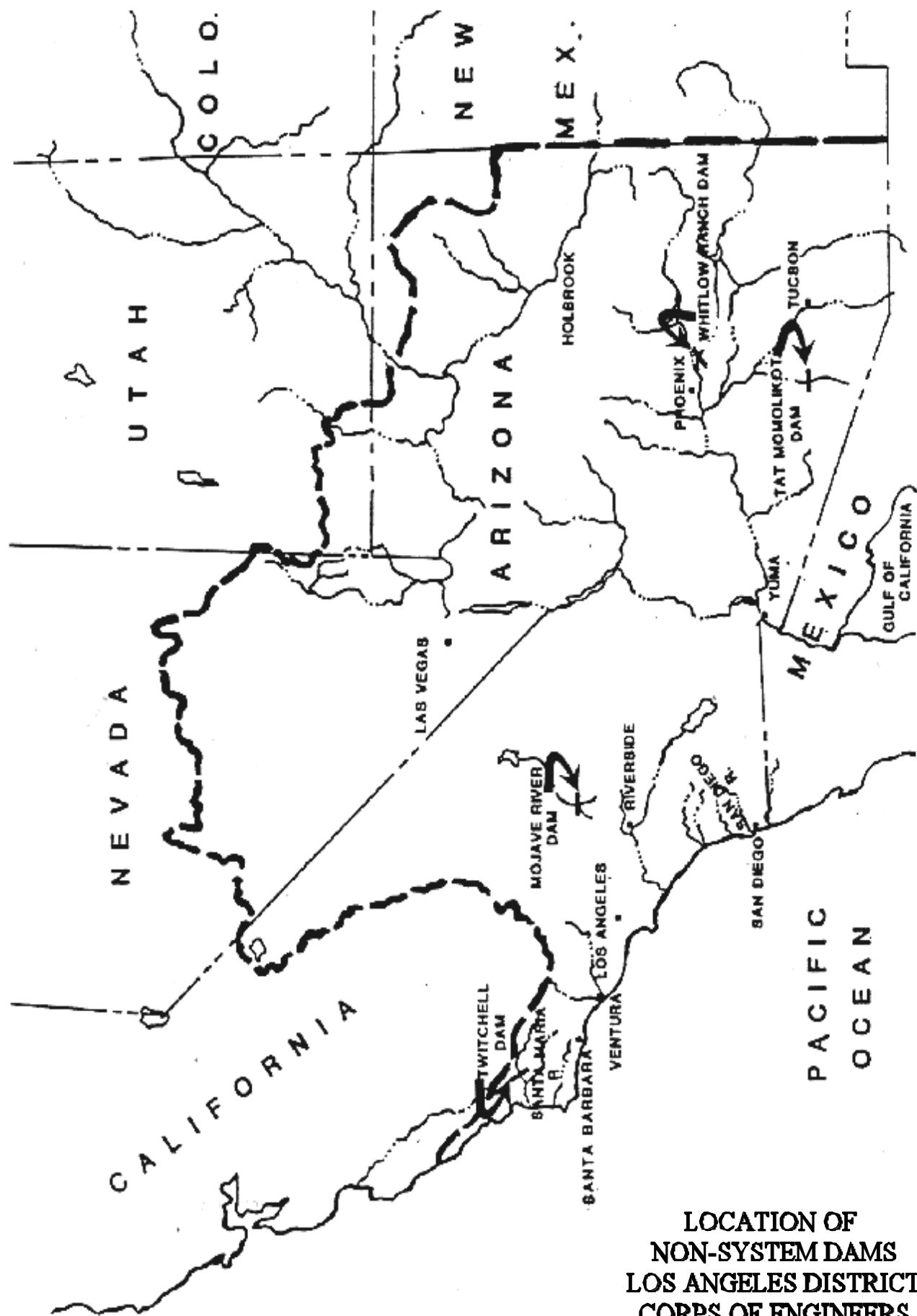
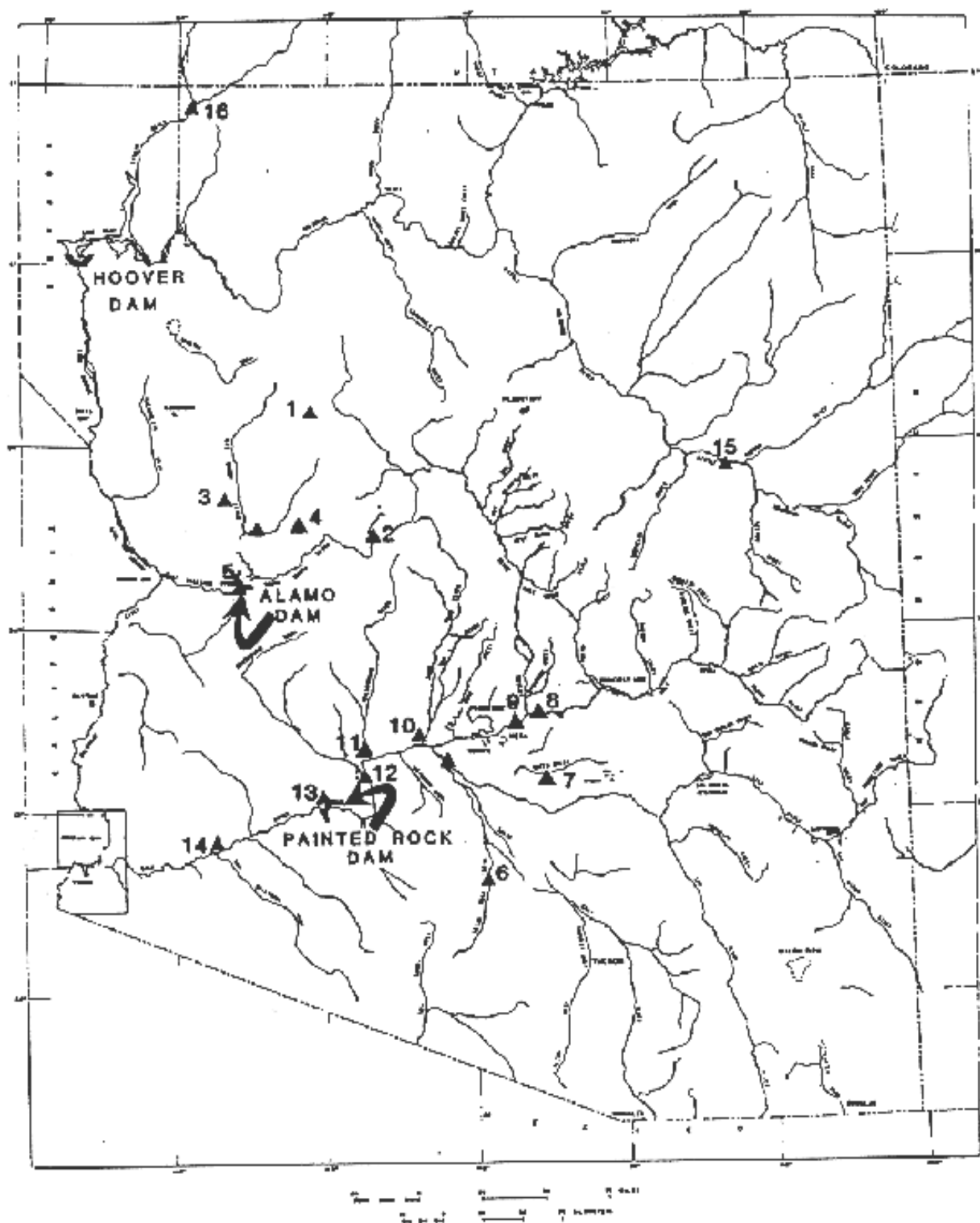


FIGURE 5



▲⁸ Station number (see table 9)

**LOS ANGELES DISTRICT
GOES DATA
COLLECTION PLATFORMS
IN ARIZONA**

FIGURE 6

BREA DAM

LACDA

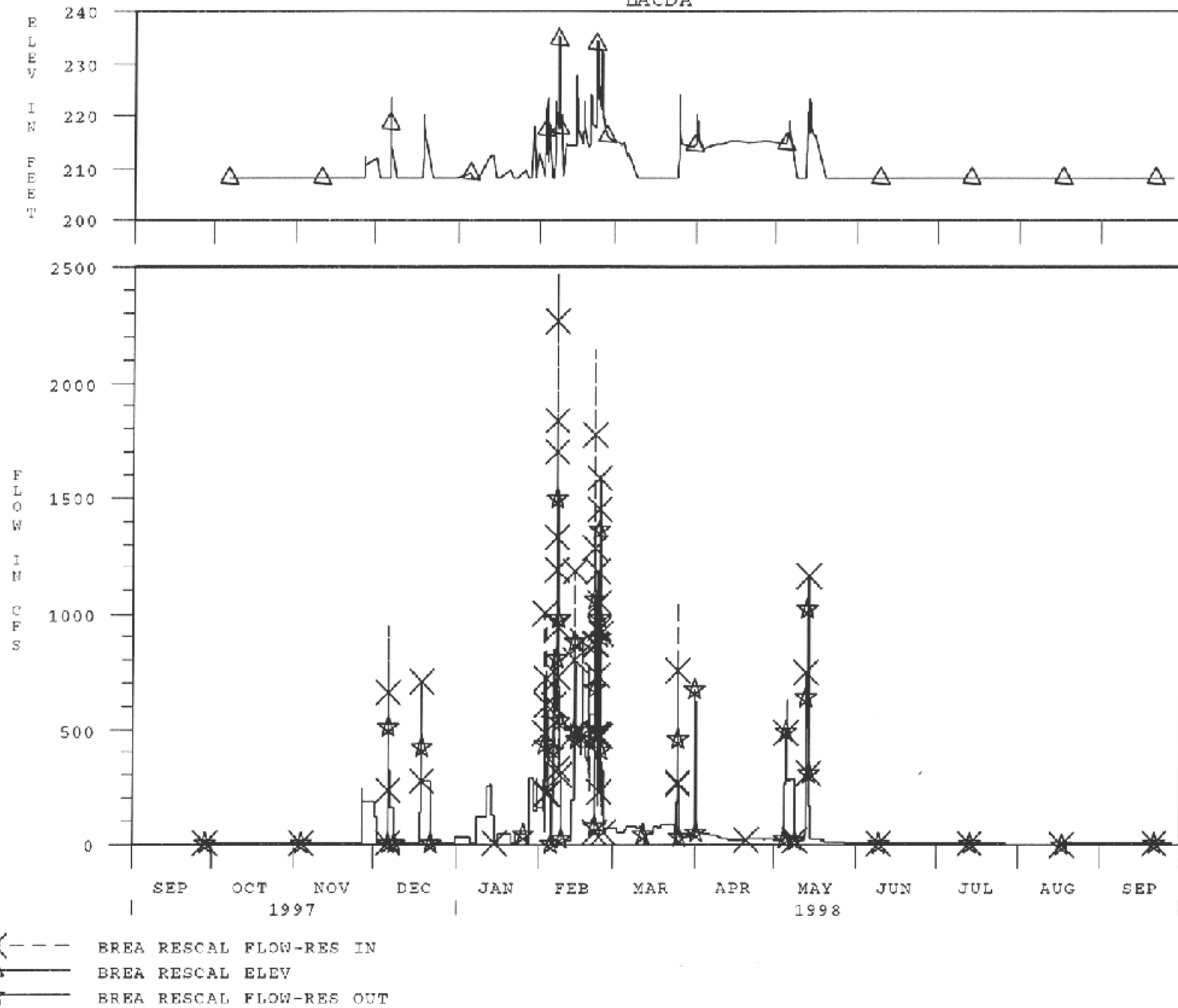


FIGURE 7

FULLERTON DAM

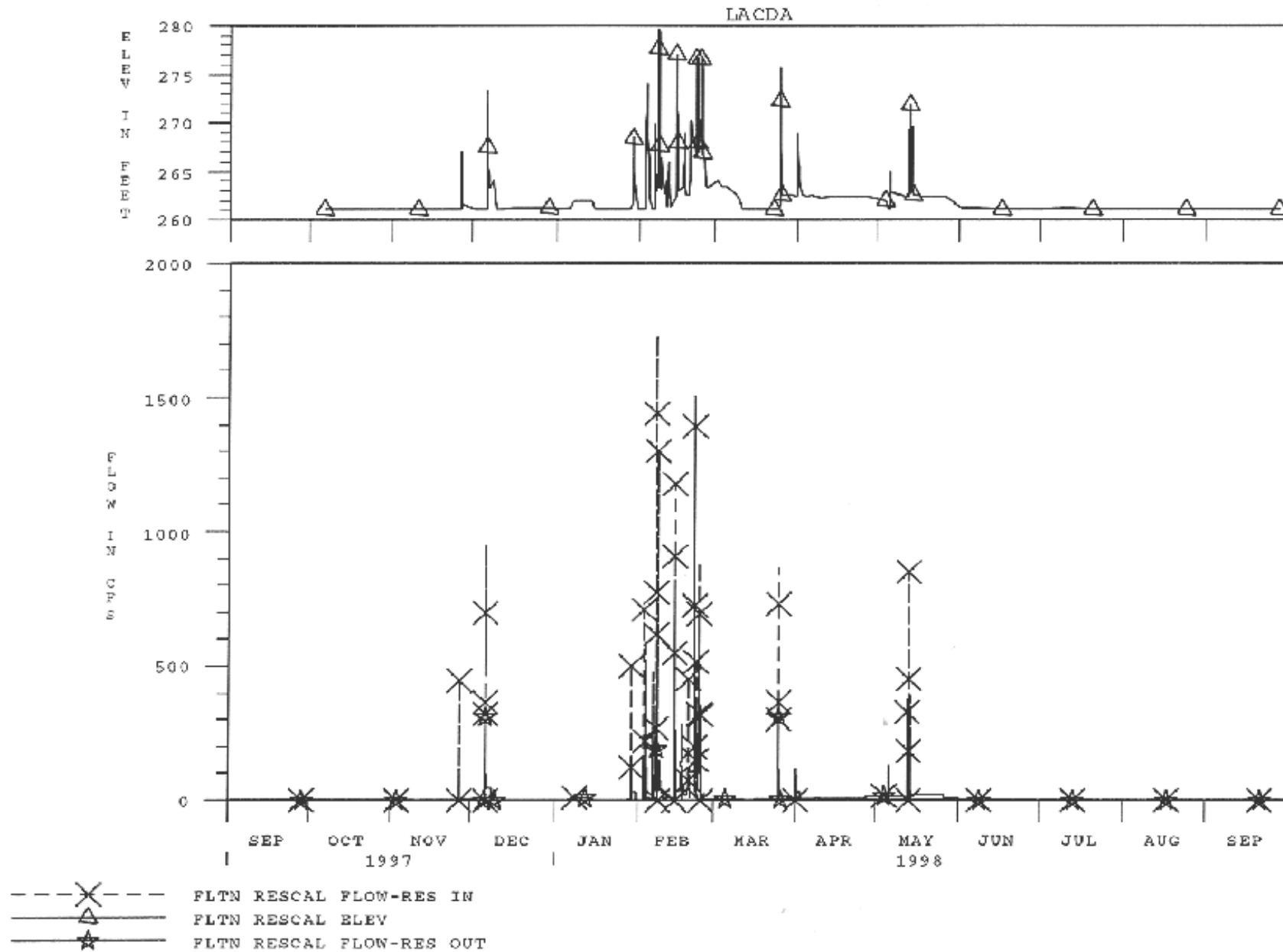


FIGURE 8

HANSEN DAM

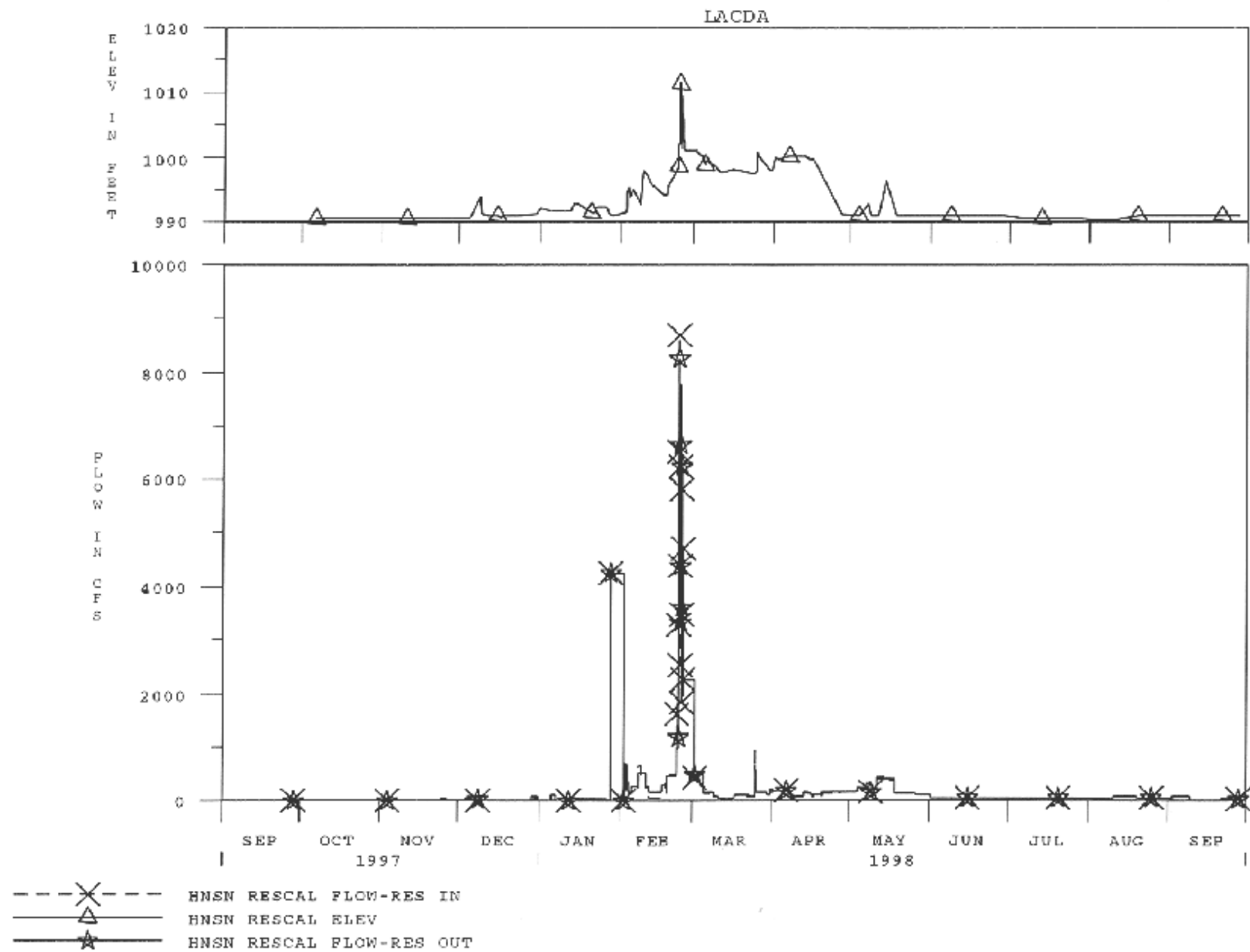


FIGURE 9

SANTA FE DAM

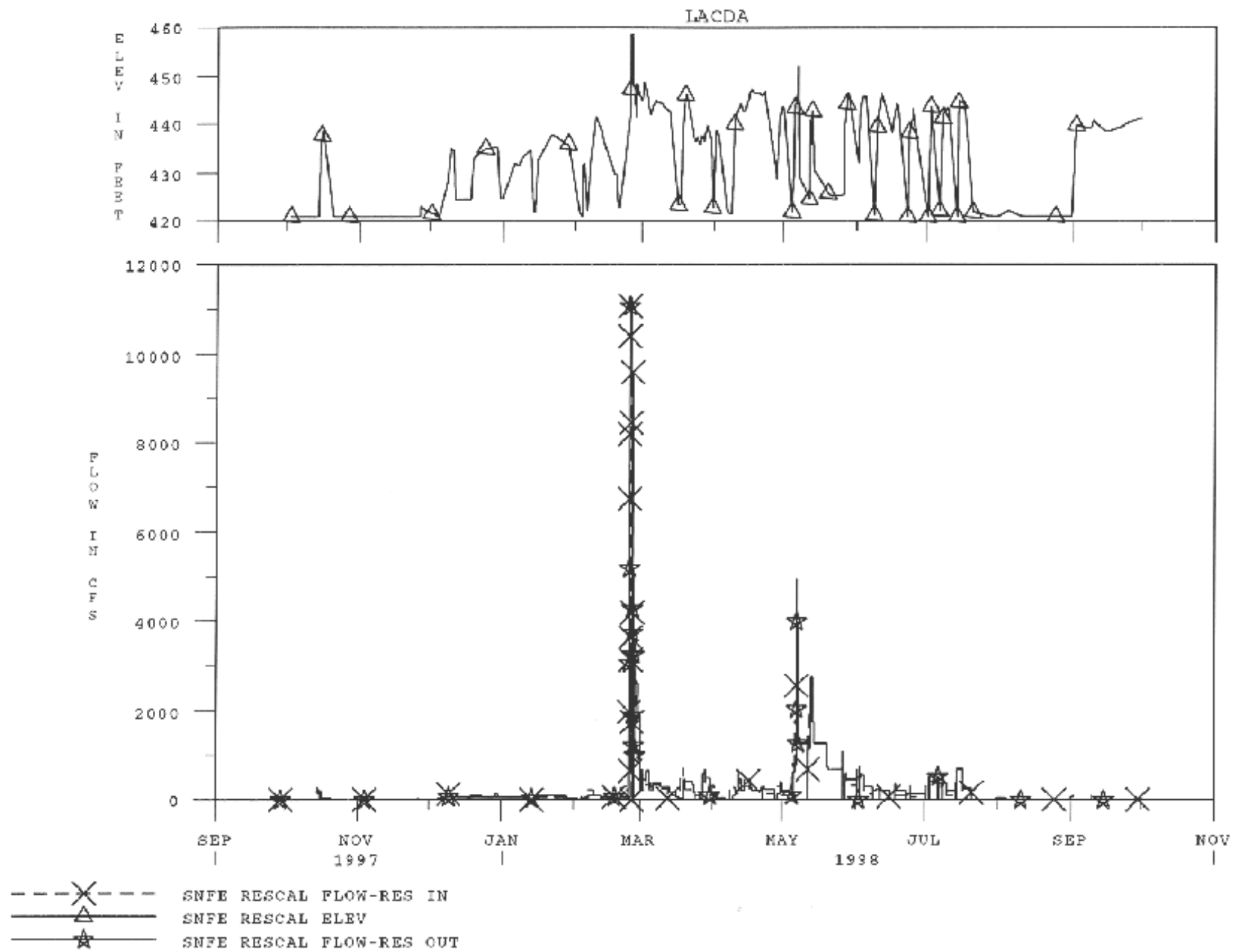


FIGURE 10

14DEC98 10:26:41

SEPULVEDA DAM

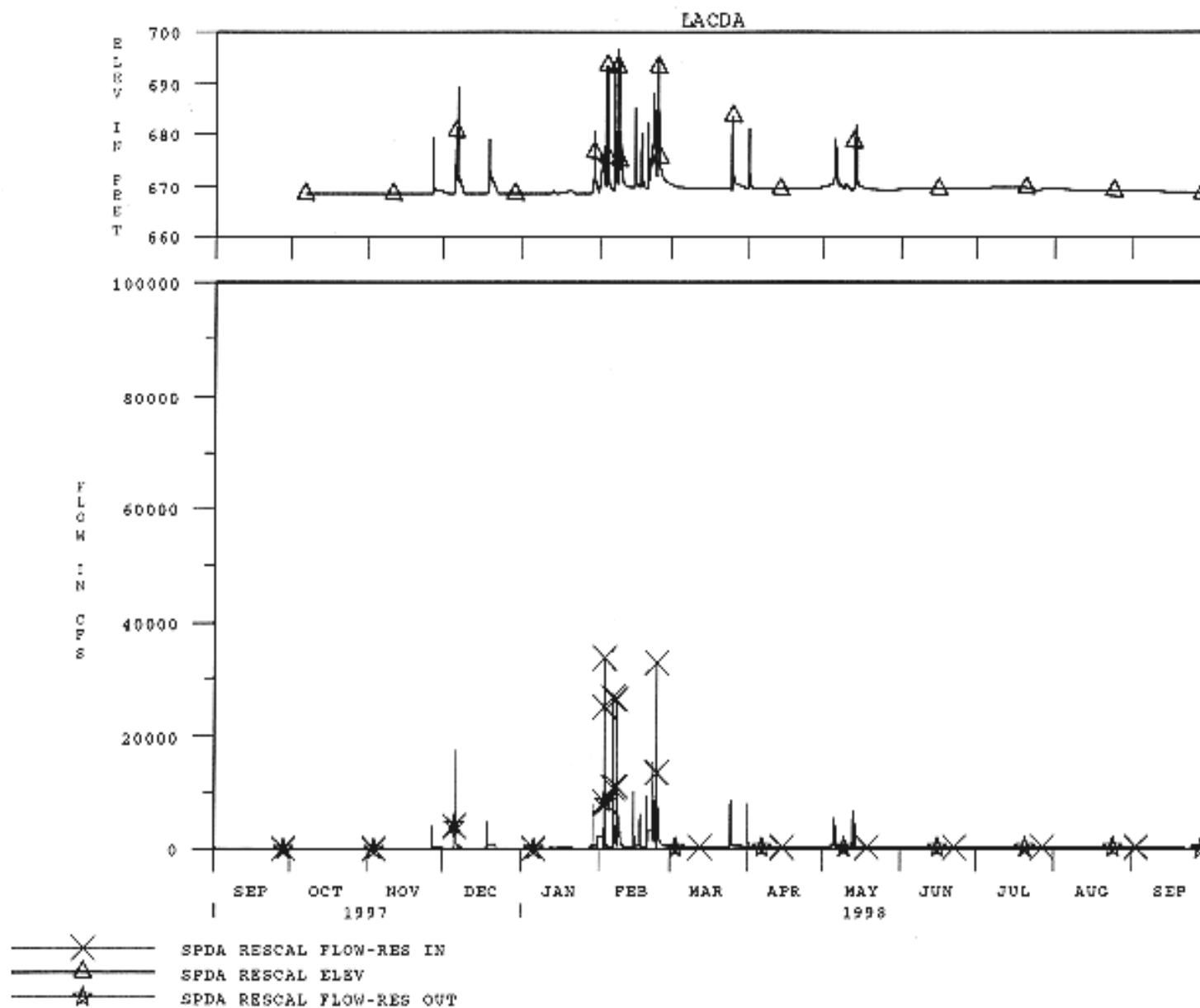


FIGURE 11

14DEC98 10:18:09

WHITTIER NARROWS DAM RIO HONDO

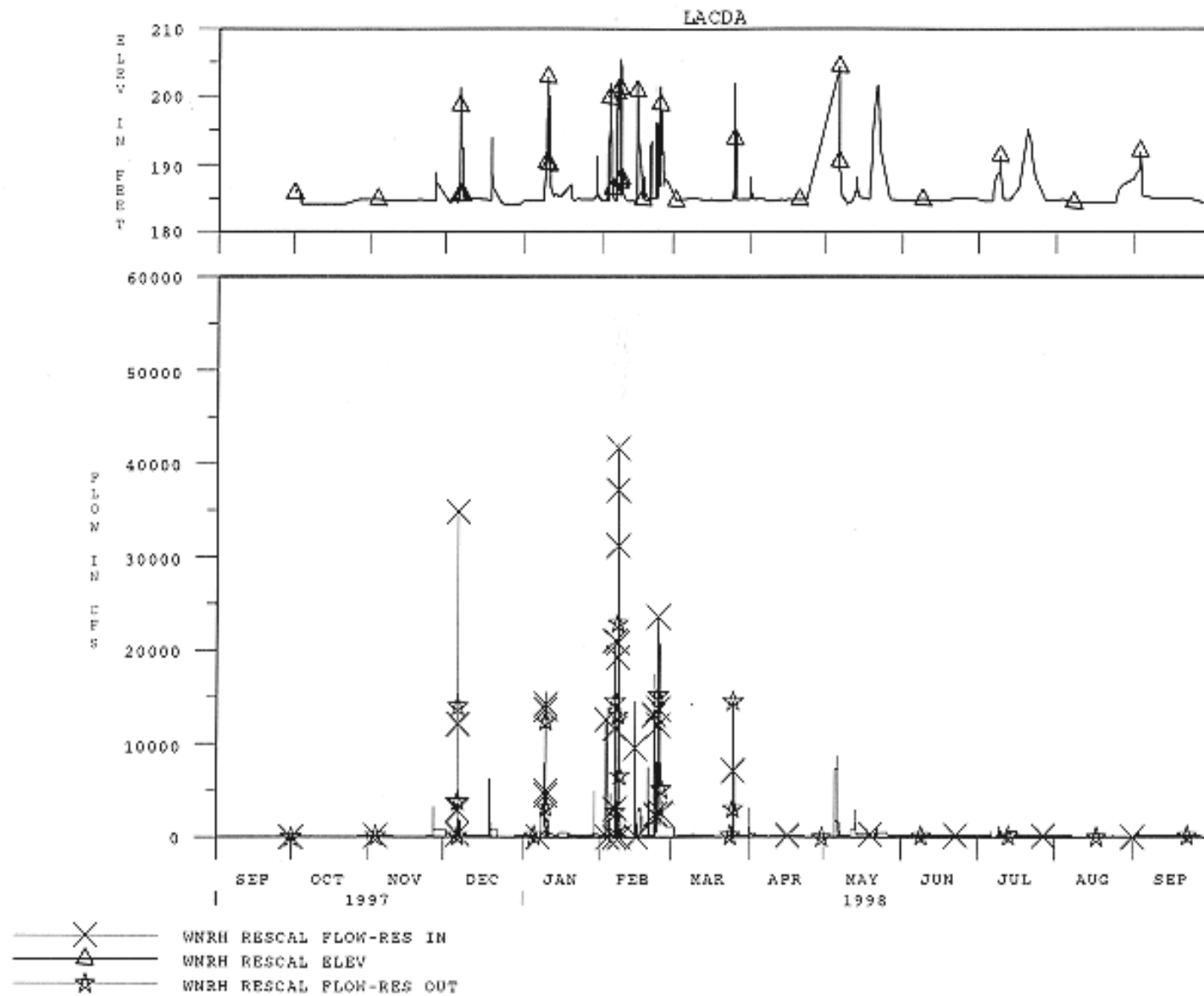


FIGURE 12

14DEC98 10:23:55

WHITTIER NARROWS DAM SAN GABRIEL

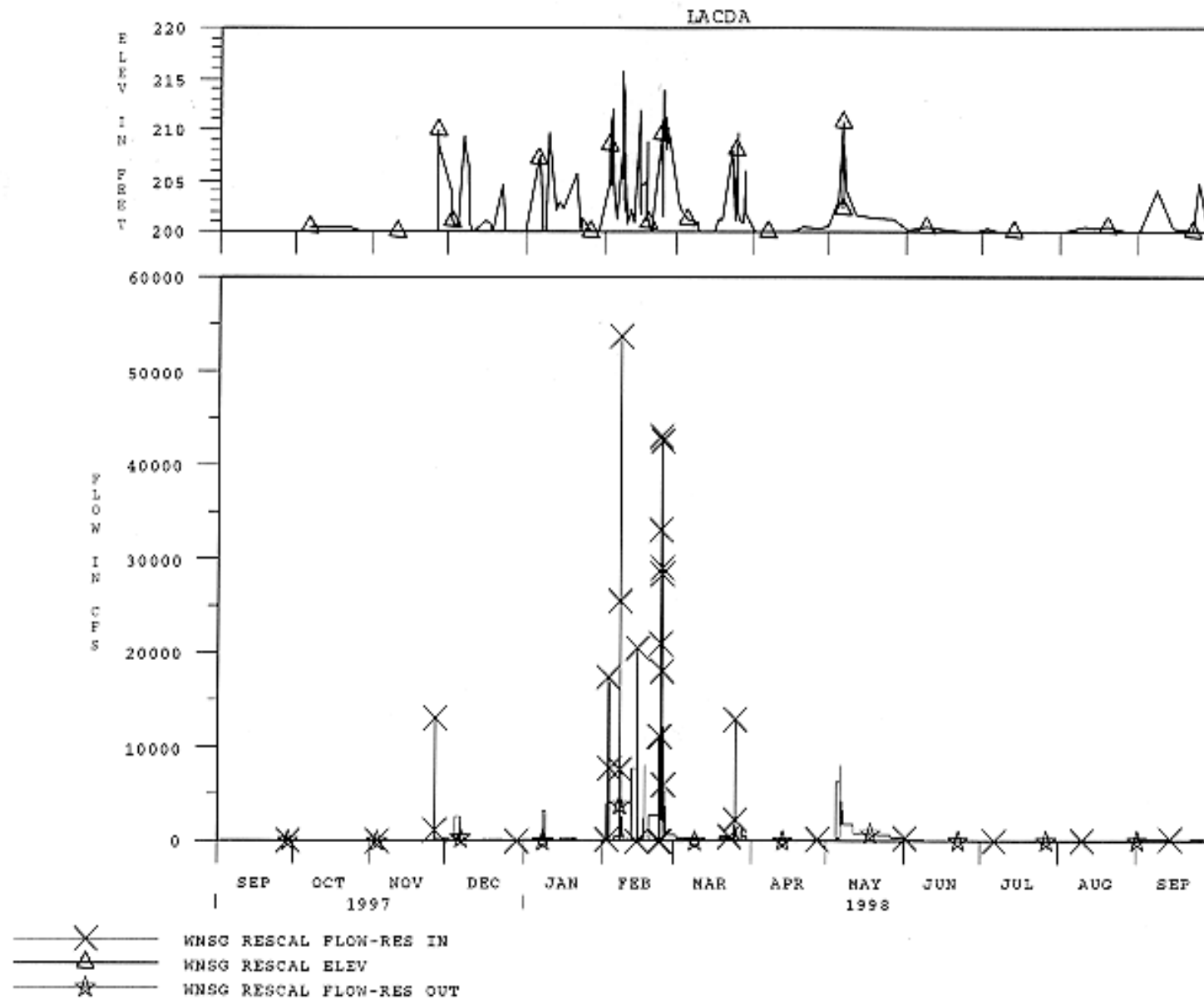


FIGURE 13

CARBON CANYON DAM

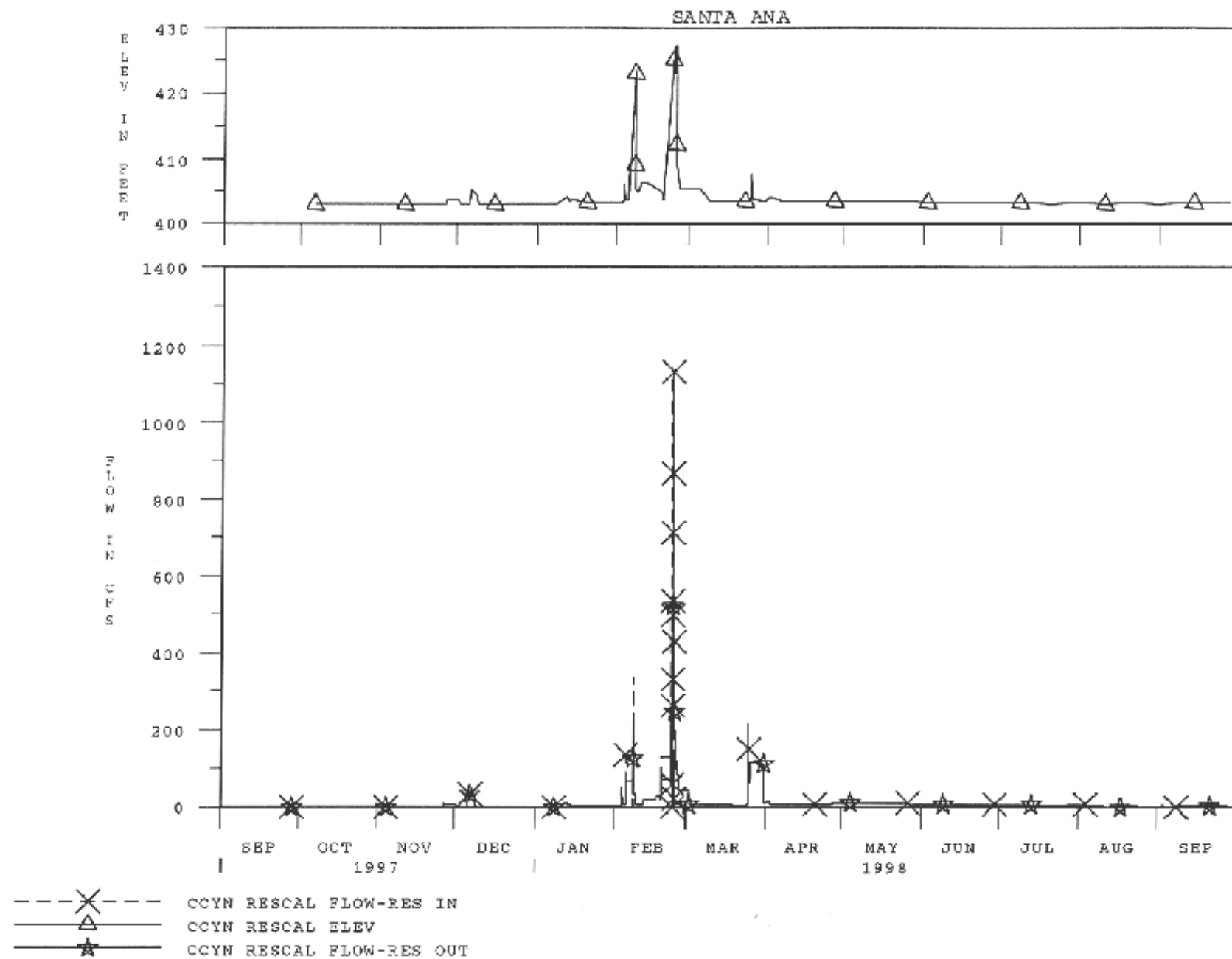


FIGURE 14

14DEC98 10:32:44

PRADO DAM

SANTA ANA

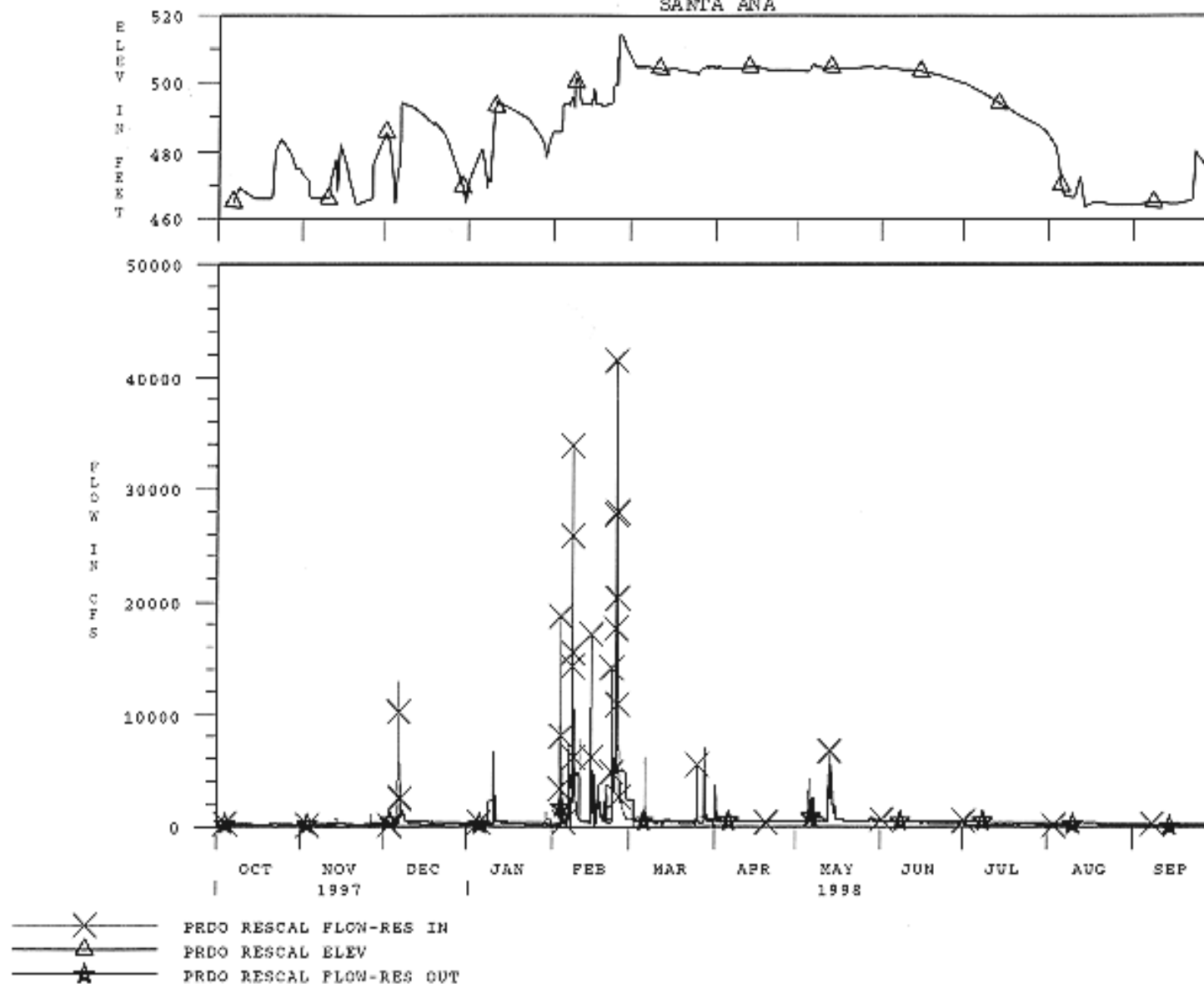


FIGURE 15

SAN ANTONIO DAM

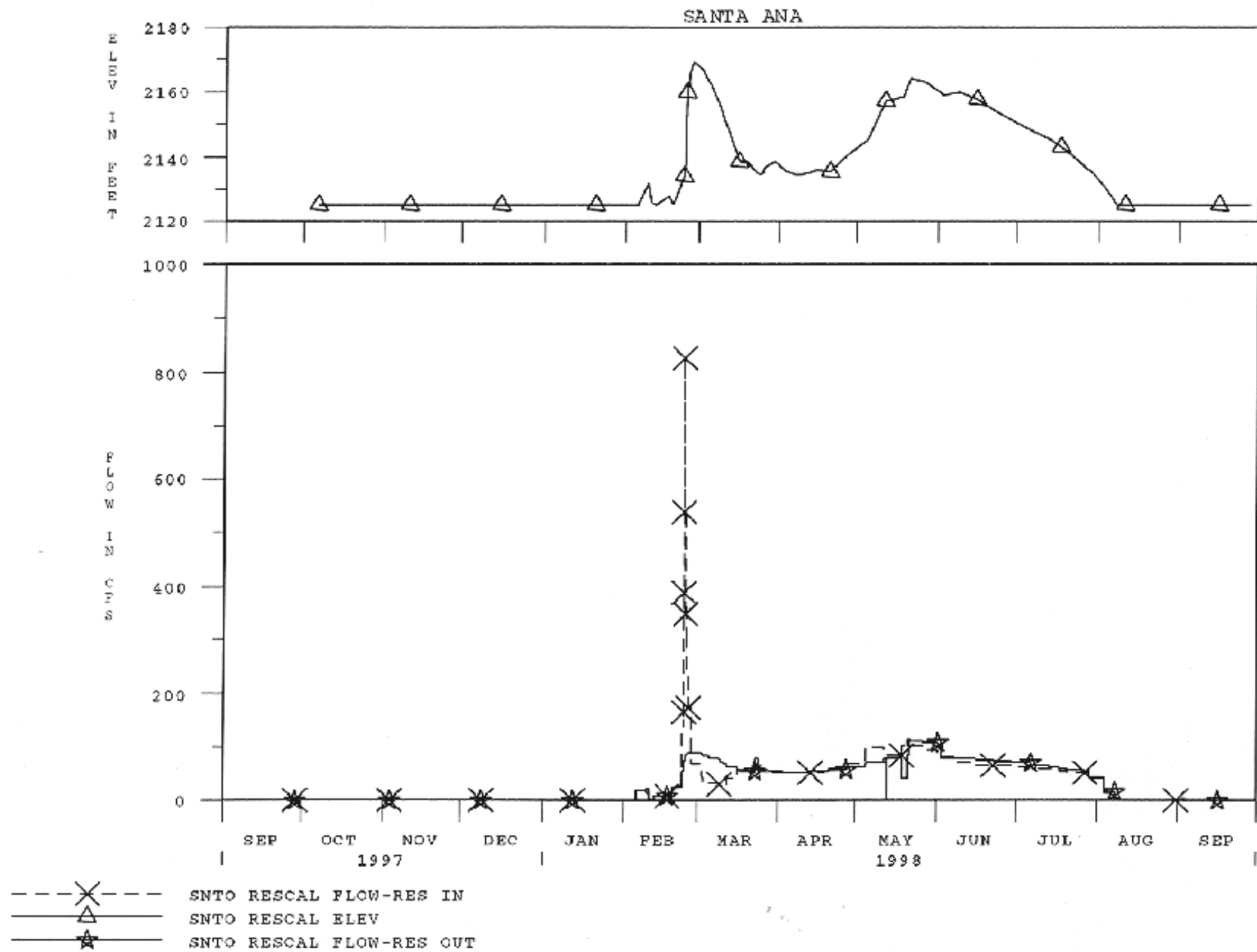


FIGURE 16

14DEC98 10:29:49

PAINTED ROCK DAM

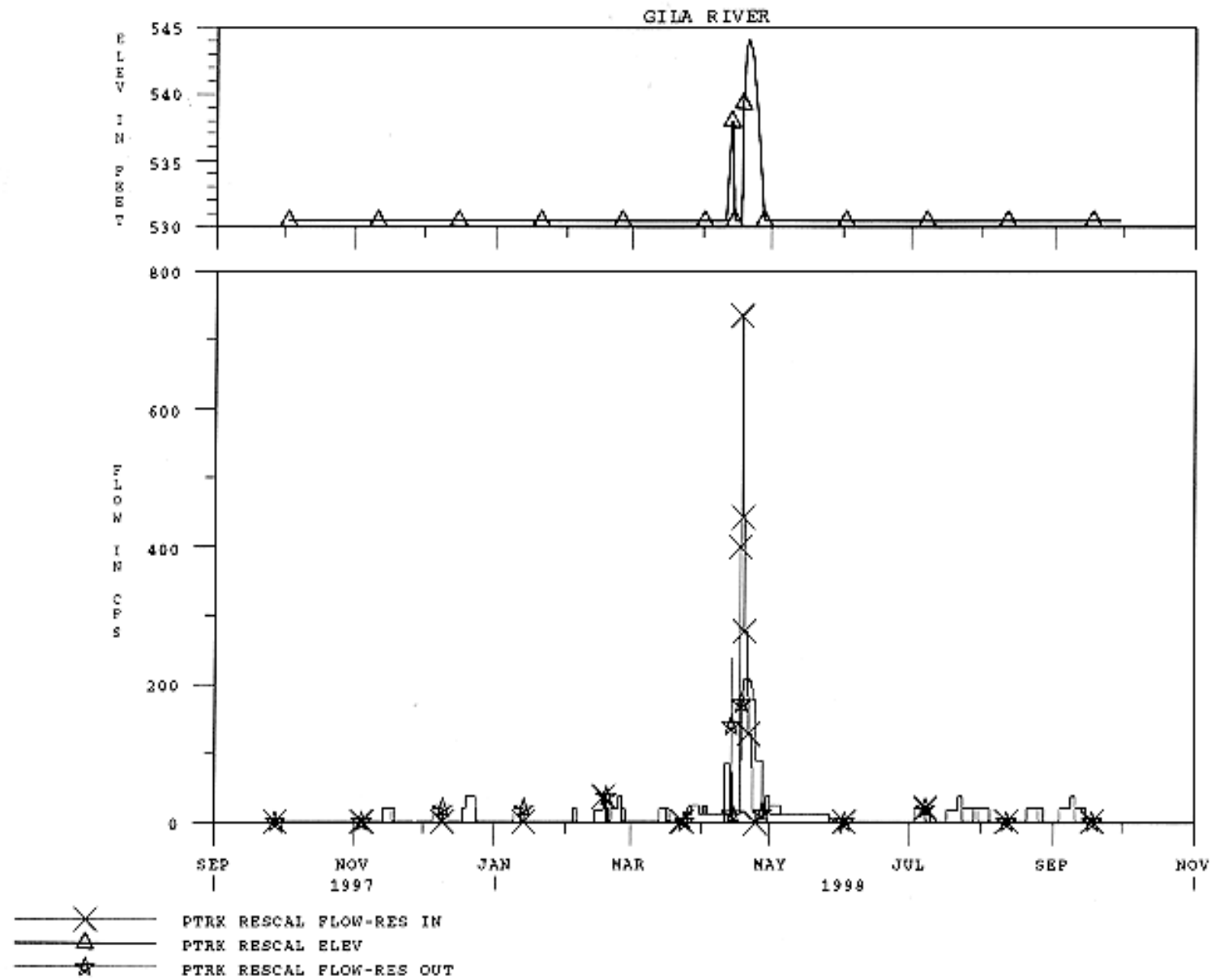


FIGURE 17

14DEC98 10:28:55

ALAMO DAM

BILL WILLIAMS

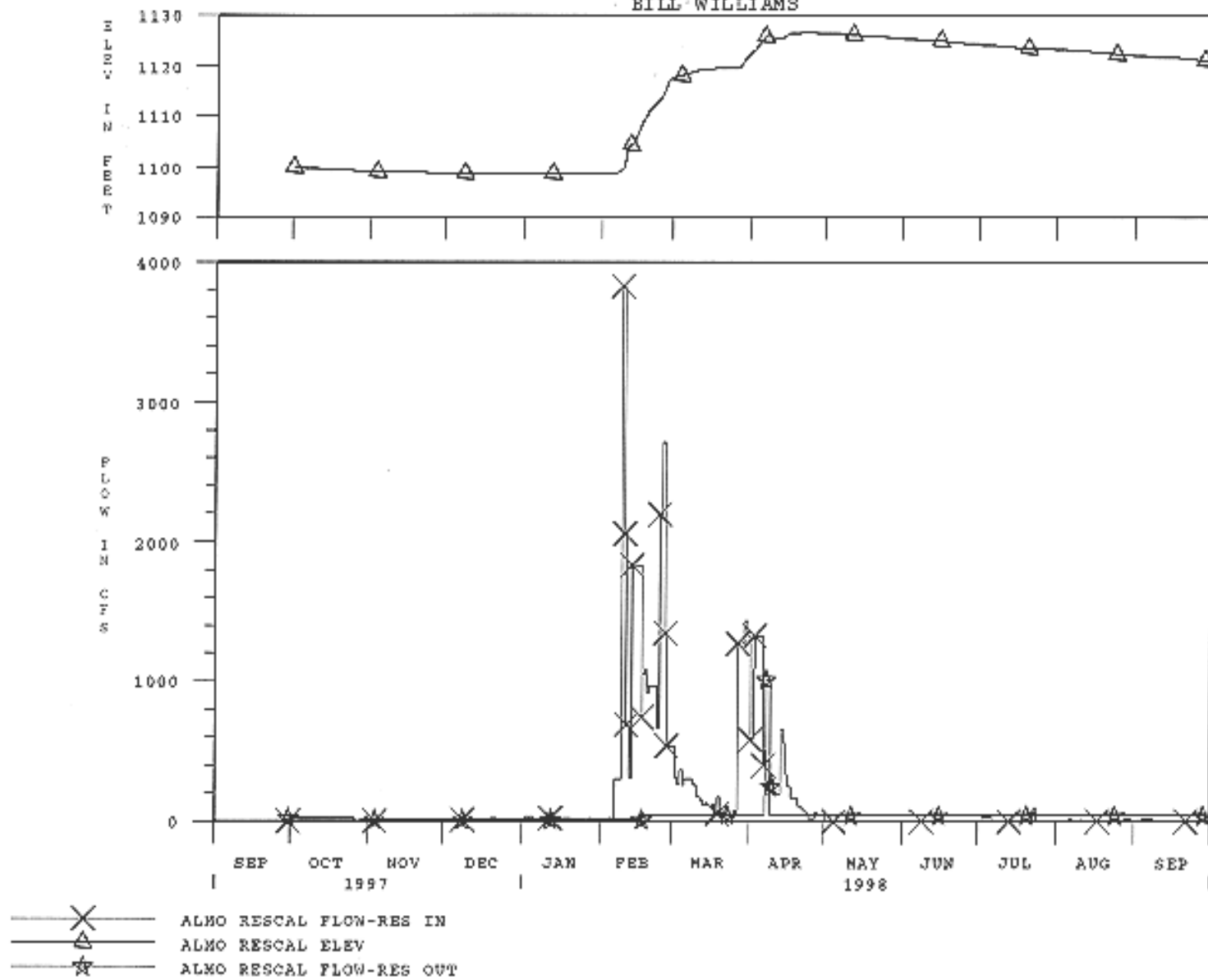


FIGURE 18

14DEC98 10:27:42

TWICHELL DAM

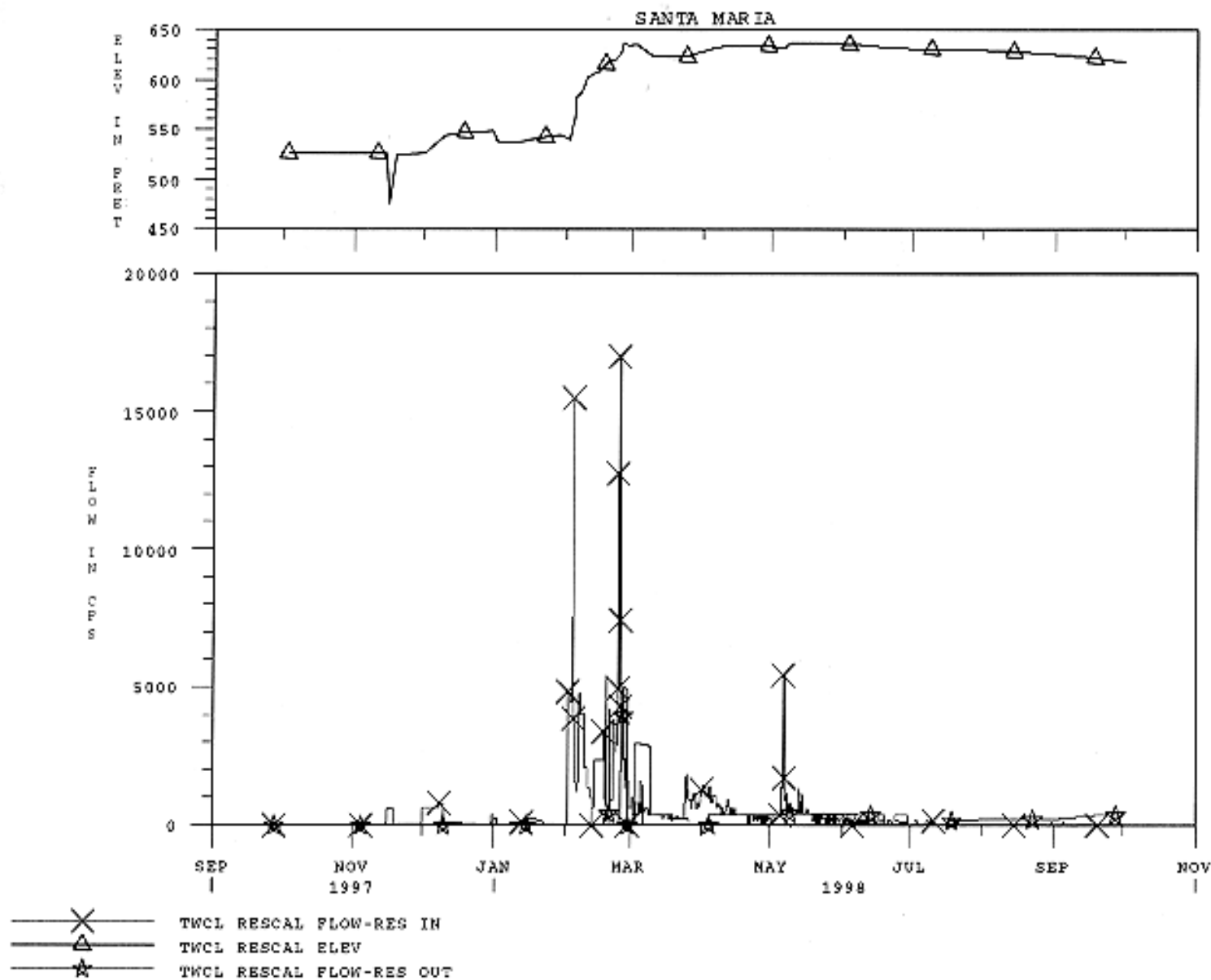


FIGURE 19

APPENDIX A

MEMORANDUM FOR CESP-D-ET-E

SUBJECT: Y2K Certification Status for the Water Control Data System

1. This memorandum is provided in response to a request from Gerhard Krueger, South Pacific Division, concerning the status of Year 2000 (Y2K) problem planning and preparation within Los Angeles District's Reservoir Regulation Section. The following paragraphs provide current Y2K problem assessments, proposed solutions, current and proposed tests, and provide details of Reservoir Regulation's participation in an IM-lead District effort to mitigate the effects of the Y2K problem.

2. Computer Hardware and Associated Operating Systems: the following table details the status of all computer systems utilized within Reservoir Regulation and includes hardware issues, operating system issues and other issues relative to the Y2K problem. In addition, proposed solutions to all known problems are provided. Note that portable computers are being handled at the District level by the IM Division.

System Type, Quantity and Name(s):	Data Collectors (2 each): splwc72 and splwc74
Primary Use:	Collect Los Angeles Telemetry System (LATS) and ALERT data
Hardware Platform:	ALR Evolution V St PC
Operating System:	SCO Unix Openserver 3.0 Enterprise System
Hardware Issues:	ALR BIOS is not Y2K compliant.
O/S Issues:	Maintenance supplement required to ensure correct Year 2000 date processing.
Other Issues:	SCO Software Development System 3.0: maintenance supplement required to ensure correct Year 2000 date processing.
Proposed Resolution:	Two Y2K compliant replacement PCs have been obtained. SCO indicates correct date processing is achieved when maintenance supplement SLS UOD426 is applied. This supplement has been obtained and will be applied in conjunction with the operating system installation on the replacement data collectors.

System Type, Quantity and Name(s):	Data Collector (1 each): splwc77
Primary Use:	Collect GOES data via DomSat system and pre-process.
Hardware Platform:	Gateway 2000 P5-75 PC
Operating System:	SCO Openserver 3.0 Enterprise System
Hardware Issues:	None identified; passes Y2K compliance test.
O/S Issues:	Maintenance supplement required to ensure correct Year 2000 date processing.
Other Issues:	DomSat receive station software compensates for NESDIS' use of two digit year on message headers by adding 1900 to years greater than 79 and 2000 to years less than 80. Interpreter/translator and conversion software utilized by Water Control were declared Year 2000 capable by the developing company, Integral Systems, Inc.
Proposed Resolution:	SCO indicates correct date processing is achieved when maintenance supplement SLS UOD426 is applied. This supplement has been obtained and will be applied to this system.
System Type, Quantity and Name(s):	Water Control Workstation (2 each): spl63 and spl64
Primary Use:	Process, store, disseminate LATS, ALERT, GOES data.
Hardware Platform:	Sun SPARC 20
Operating System:	Solaris 2.5
Hardware Issues:	Requires compliant version of Solaris.
O/S Issues:	Sun Microsystems indicates patches must be installed to ensure compliance.
Other Issues:	None identified.
Proposed Resolution:	Obtain and install any of 27 patches required for compliance that have not been installed. (Note: security related patches have been installed previously.)
System Type, Quantity and Name(s):	Unix Workstation (1 each): spl66
Primary Use:	GIS
Hardware Platform:	Sun Ultra SPARC 1 Creator

Operating System:	Solaris 2.5.1
Hardware Issues:	Requires compliant version of Solaris.
O/S Issues:	Sun Microsystems indicates patches must be installed to ensure compliance.
Other Issues:	According to ESRI, Arc/Info version 7.0.4 is not Y2K compliant and ArcView 3.0a is compliant with minor issues.
Proposed Resolution:	Obtain and install any of 27 patches required for compliance that have not been installed. (Note: security related patches have been installed previously.) Arc/Info, ArcView and other ESRI products are under maintenance contract with CDC. Compliant upgrades will be obtained from CDC.
System Type, Quantity and Name(s):	Windows NT Server (1 each): spl61
Primary Use:	Hosts Reservoir Regulation's web site
Hardware Platform:	Dell Poweredge 2200
Operating System:	Windows NT Server 4.0
Hardware Issues:	None identified; passes Y2K compliance test.
O/S Issues:	Year 2000 problems associated with print queues, "find files," custom date errors via Doc Properties Viewer, and User Manager.
Other Issues:	None identified.
Proposed Resolution:	Install latest Windows NT Service Pack (4.0).
System Type, Quantity and Name(s):	Windows NT Server (1 each): 121-b4424
Primary Use:	LATS Central remote polling of RTUs
Hardware Platform:	ALR Evolution V St
Operating System:	Windows NT Server 4.0
Hardware Issues:	ALR BIOS is not Y2K compliant.

O/S Issues:	Year 2000 problems associated with print queues, "find files," custom date errors via Doc Properties Viewer, and User Manager.
Other Issues:	LATS Central software created with Visual Basic 5.0 utilizes the OLE Automation Library provided with Windows NT 4.0 (and other products) and provides correct Year 2000 date processing.
Proposed Resolution:	IM is researching obtaining BIOS replacements or software fixes for all ALR computers within the District. Install latest Windows NT Service Pack (4.0).
System Type, Quantity and Name(s):	Windows NT Server (1 each): spl62
Primary Use:	Backup Domain Controller - Proposed shared database repository.
Hardware Platform:	Gateway 2000 P5-75
Operating System:	Windows NT Server 4.0
Hardware Issues:	None identified; passes Y2K compliance test.
O/S Issues:	Year 2000 problems associated with print queues, "find files," custom date errors via Doc Properties Viewer, and User Manager.
Other Issues:	None identified.
Proposed Resolution:	Install latest Windows NT Service Pack (4.0).
System Type and Quantity:	Desktop PCs (6 each)
Primary Use:	Water Control access/Office automation
Hardware Platform:	ALR Evolution V St and
Operating System:	Windows 95 OSR2
Hardware Issues:	ALR BIOS is not Y2K compliant.
O/S Issues:	Year 2000 problems with DIR and DATE commands.
Other Issues:	None identified.

Proposed Resolution:	IM is researching obtaining BIOS replacements or software fixes for all ALR computers within the District. An upgrade to the "command.com" file will be obtained and installed to eliminate Windows 95 Y2K incompatibilities. Alternative is to install upgraded operating system.
System Type and Quantity:	Desktop PCs (6 each)
Primary Use:	Water Control access/Office automation
Hardware Platform:	Zenith 466X+ (5 each), Zenith Z100+ (1 each)
Operating System:	Windows 95 OSR2
Hardware Issues:	BIOS is not Y2K compliant.
O/S Issues:	See below
Other Issues:	See below
Proposed Resolution:	PCs are slated for replacement in FY99.
System Type and Quantity:	Desktop PCs (5 each)
Primary Use:	Water Control access/Office automation
Hardware Platform:	Dell Optiplex XMT 590 (2 each), Dell Optiplex XMT 1566 (2 each), Dell Optiplex Gxa (1 each)
Operating System:	Windows 95 OSR2
Hardware Issues:	None identified; all pass Y2K compliance test.
O/S Issues:	Year 2000 problems with DIR and DATE commands.
Other Issues:	None identified.
Proposed Resolution:	An upgrade to the "command.com" file will be obtained and installed to eliminate Windows 95 Y2K incompatibilities. Alternative is to install upgraded operating system.

2. Hardware Issues: LATS RTUs and GOES DCPs comprised of various Synergetics manufactured modules have been tested in-house for Y2K functionality. A test LATS RTU was rolled ahead to the year 2000 and allowed to collect and transmit data. Data was received by the normal LATS data collection platforms without incident. Similarly, a GOES DCP was rolled ahead to the year 2000 and allowed to transmit. Data was received by our local DomSat receive station (after retransmission from the DCS Automated Processing System in Wallops, VA.) with

no adverse effects noted. Conversations with NESDIS indicate that NESDIS provides the timestamp on any incoming messages and does not rely on any date that may be provided by the DCP. Additionally, Synergetics has contacted Reservoir Regulation personnel concerning upgrades to both the Pearl upload/download software and the SCADA software that operates on the 3401 Master Control Module; Reservoir Regulation will immediately pursue obtaining any upgrades made available from Synergetics to ensure RTU/DCP Y2K compliance.

3. Software Issues: the latest versions of Y2K compliant HEC software (e.g. DSPLAY, DSSUTL, etc.) that are not currently resident on Water Control systems will be obtained from HEC and installed. In addition, the latest HEC Utilities Library (HEC-LIB) will be downloaded and installed. Locally developed software which utilizes this library will then be recompiled and tested to ensure Y2K compliance. The locally developed Reservoir Calculation program (ResCal) is slated to be completely rewritten within the coming year.

4. Scripts and Macros: the majority of scripts operating on Water Control workstations are written using Tcl 8.0p2 often in conjunction with Expect 5.26. Both products are certified as Y2K compliant. Scripts written in the native shells of the operating system will function correctly on compliant systems. Macro files which interact with HEC compliant software should similarly be compliant. Instances where two digit years within macros are assigned to the incorrect century (e.g. 02 incorrectly converted to 2002 when 1902 was desired) can be corrected on a case-by-case basis.

5. Proposed Testing: Upon completion of upgrading data collector hardware, patching operating systems and upgrading HEC software, Reservoir Regulation will conduct Y2K compatibility testing. This testing will involve selected RTU/DCPs, the LATS Central computer, the backup data collector and the backup Sun Workstation. Points of review will include but not necessarily be limited to:

- a) rollover date testing - ensuring all systems rollover properly to the year 2000
- b) reboot testing - ensuring all systems will retain year 2000 dates after rebooting
- c) leap year testing - ensuring systems handle year 2000 and subsequent leap years properly as leap years
- d) calculation testing - determining if date related calculations (e.g. difference between two dates) are completed successfully
- e) sort testing - determining if date related sorting is completed successfully
- f) general failure and error testing - determining if any date related functions fail to process or fail to successfully complete

Completion of hardware and software upgrades, installation of operating system patches, and compliance testing is scheduled to be completed by 31 December 1998.

6. Participation in District-wide Effort to Resolve Y2K Problems: Reservoir Regulation personnel are actively participating in the IM-lead effort to address Y2K problems within the District. Reservoir Regulation has prepared a 22 page listing of all mission critical hardware and all software operating on all computers within its purview. This listing, when combined with similar documents provided by other Sections, will provide a contact list of vendors to be queried concerning the Y2K compatibility of their products. In addition, the IM Division is working with manufacturers such as ALR, Toshiba and Compaq to obtain the latest BIOS revision or workarounds required to ensure Y2K compliance for desktop and portable computers systems utilized throughout the District.

BRIAN G. TRACY, P.E.
Chief,
Reservoir Regulation Section